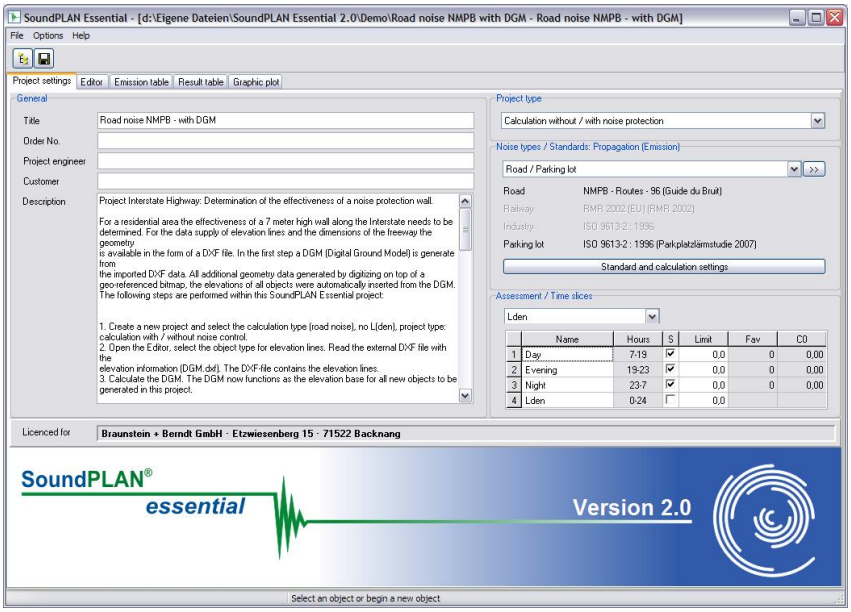
**Manual**

# SoundPLAN® *essential* 2.0


SoundPLAN Essential - [d:\Eigene Dateien\SoundPLAN Essential 2.0\Demo\Road noise NMPB with DGM - Road noise NMPB - with DGM]
File Options Help
Project settings Editor Emission table Result table Graphic plot
General
Title
Road noise NMPB - with DGM
Order No.
Project engineer
Customer
Description
Project Interstate Highway: Determination of the effectiveness of a noise protection wall.
For a residential area the effectiveness of a 7 meter high wall along the Interstate needs to be determined. For the data supply of elevation lines and the dimensions of the freeway the geometry
is available in the form of a DXF file. In the first step a DGM (Digital Ground Model) is generate from
the imported DXF data. All additional geometry data generated by digitizing on top of a geo-referenced bitmap, the elevations of all objects were automatically inserted from the DGM.
The following steps are performed within this SoundPLAN Essential project:
1. Create a new project and select the calculation type (road noise), no Lden), project type: calculation with / without noise control.
2. Open the Editor, select the object type for elevation lines. Read the external DXF file with the
elevation information (DGM.dxf). The DXF-file contains the elevation lines.
3. Calculate the DGM. The DGM now functions as the elevation base for all new objects to be generated in this project.
Project type
Calculation without / with noise protection
Noise types / Standards: Propagation (Emission)
Road / Parking lot
Road NMPB - Routes - 96 (Guide du Bruit)
Railway RMR 2002 (EU) (RMR 2002)
Industry ISO 9613-2 : 1996
Parking lot ISO 9613-2 : 1996 (Parkplatzlärmstudie 2007)
Standard and calculation settings
Assessment / Time slices
Lden
Name Hours S Limit Fav C0
1 Day 7-19 0,0 0 0,00
2 Evening 19-23 0,0 0 0,00
3 Night 23-7 0,0 0 0,00
4 Lden 0-24 0,0
Licenced for
Braunstein + Berndt GmbH - Etzwiesenberg 15 - 71522 Backnang
SoundPLAN®
essential
Version 2.0
Select an object or begin a new object

**Braunstein + Berndt GmbH / SoundPLAN International LLC**

**January 2011**

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# SoundPLAN *essential*

## Introduction

SoundPLAN *essential* was conceived with occasional users in mind who do not have an in-depth background in acoustics and want to attain results of a standard case noise calculation with a minimum requirement of time but the professionalism of the SoundPLAN calculation core.

All steps needed to complete a standard project are accessible via tabs on the main window. The project definition, with a project description and all needed settings, is on the opening page. Other tabs lead to the data editor, the calculations and the formatting of the output in tabular and graphical form.

## Installation and initialisation at the first call

You must have administrator rights for installation. SoundPLAN *essential* is protected by a hardlock and a specific customer license file. Attach the hardlock to a USB port before the installation starts, copy the license file, you received as an email attachment to your computer and insert the CD. The installation starts automatically. Follow the instructions of the installation program.

At the end of the installation, select which program languages and which language versions of help file and manual should be installed.

When you open SoundPLAN *essential* for the first time, demo projects depicting different noise control scenarios are installed on your disk in the folder "Documents and Settings/……/My Documents/SoundPLAN essential 2.0/Demo." Select one of the listed demo projects (SoundPLAN *essential* always needs an open calculation). On the next start the latest edited calculation is automatically loaded.

## Open and Create Projects

A SoundPLAN *essential* calculation consists of several files, which are stored jointly in one folder. When you open or create a calculation, you select a folder not a file. All data being part of a calculation are called a project.

Each folder that is recognized as a SoundPLAN *essential* project is displayed with a white SoundPLAN logo and a blue background.

*New Project*

Invoke **FILE -> NEW PROJECT** to create a new project folder for a calculation. Enter the name of the project folder. As a default the project title is automatically taken from the name of the project folder. Use the fields project number, project engineer and customer to store additional information for the project. The field **DESCRIPTION** is a text editor for further information e.g. the telephone numbers of the customer.

*Open Project*

When the program is started, it automatically loads the project last used. If you want to open another project, select it via **FILE -> OPEN** or pick it from the list of recently opened projects in the menu **FILE**.

Pressing the right mouse button activates a popup menu with additional functions such as copy, delete or pack.

Because of possible changes in the data structures between two versions, projects generated with an older version must be converted. Converted projects can no longer be opened with an older version.

Projects prepared with an older version are marked with a gray project folder. When you click on the project folder, you will be asked if you want to convert the project.

## A quick approach to SoundPLAN *essential*

- Create a new project using **FILE -> NEW PROJECT**.
- Select the project type (calculation of a single variant or calculation of before and after scenarios), the noise types and the time slots along with the noise limits.
- Switch to the tab index card "*Editor*." You can prepare the geometry data on the basis of a scanned and geo-referenced bitmap or by importing from DXF, ESRI Shapefile or ASCII files.

  Activate the objects via the symbol bar. Line and area type objects are closed with a double click. You can generate right-angled north oriented objects by pulling a frame with the left mouse button.

  For projects with terrain it is advisable to enter elevation lines and spot heights first and then produce the digital ground model (DGM) (click on the symbol button **ABACUS** and press the start button.) All additional objects entered or imported in the future will be placed on the DGM.

  Define the properties of the objects: Building heights, receiver names, the emissions of roads and railways, or the sound power level for industrial sources as a sum level or via a reference spectrum. When wall heights or traffic data change, enter the new values at the relevant coordinate.

  Pressing the right mouse button activates a popup menu with additional functions such as duplicate objects or insert coordinates.
- Click on the symbol button **ABACUS** and select the desired calculation type (single points, limit lines or grid noise map).

- The source emissions are documented in the tab "*emission table*". The tab "*result table*" contains the assessment levels with the documentation of limit violations and, depending on the project type the differences between two scenarios, the contribution levels at the receivers as well as the spectra at the receivers for frequency dependent calculations. Use the menu **TABLES -> SETTINGS** to edit the frame widths and the fonts for all tables and to change the header and footer texts.
- The maps are presented in the tab "*graphic plot*". Change to any available graphical presentation of the individual calculations using the tabs. Single point results are displayed as small tables together with the limit lines for all time slices in one map; for grid noise maps one tab is available for each time slice.

  To zoom, rotate and move the view on your map, right click and choose the appropriate option. After the operation is completed, click on the hand symbol in the top frame to deactivate the view selection mode.

  With the finger-pointer symbol activated, click on the top of the map description field in order to enter the map title, on "signs and symbols" to customize the appearance of the objects, on the length scale to enter a numerical value for the scale and on the empty bottom section of the description field to select a bitmap with your company logo.

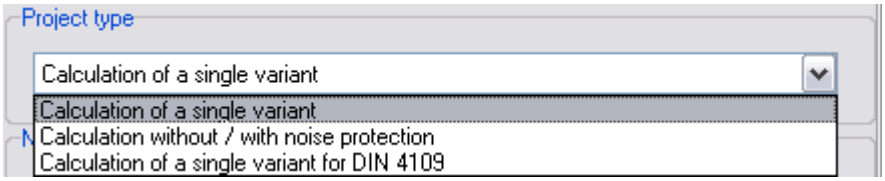
# Project Set-up

## Select Project Type

SoundPLAN *essential* distinguishes between two project types:

- Calculation of a single variant,
- Calculation of 2 variants without and with noise control.

Select the project type from the view list:


Project type
Calculation of a single variant
Calculation of a single variant
Calculation without / with noise protection
Calculation of a single variant for DIN 4109

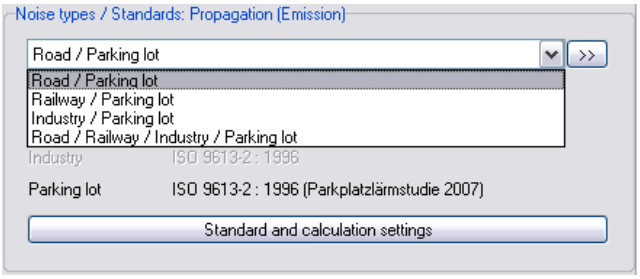
When two variants are computed, an extra column with the differences of the variants is inserted in the result table. For both variants, maps are created in the graphics section.

The calculation of a single variant for DIN 4109 is a special German calculation type and not described in this manual.

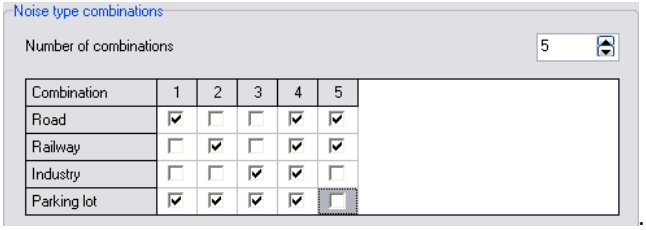
## Select the Noise Type(s)

A project may contain several different emitters (road, railway, industrial sources, parking lot), so that you can calculate and superimpose different noise types using the same geometrical data. The combinations and calculation standards are set to defaults according to the selected country settings.

Select the noise type(s) you want to calculate in this project from the view list.


Noise types / Standards: Propagation (Emission)
Road / Parking lot
>>
Road / Parking lot
Railway / Parking lot
Industry / Parking lot
Road / Railway / Industry / Parking lot
Industry
ISO 9613-2 : 1996
Parking lot
ISO 9613-2 : 1996 (Parkplatzlärmstudie 2007)
Standard and calculation settings

If you need others than the suggested combinations, click on the double arrow.




Create a new combination increasing the number of combinations or change one of the existing combinations. Use the checkboxes to activate or deactivate noise types.

Example: The investigation of the noise immissions of a road and a nearby railway line are subject of a project. The assessment levels must be calculated and documented for both emitters separately as well as superimposed for road and railway.

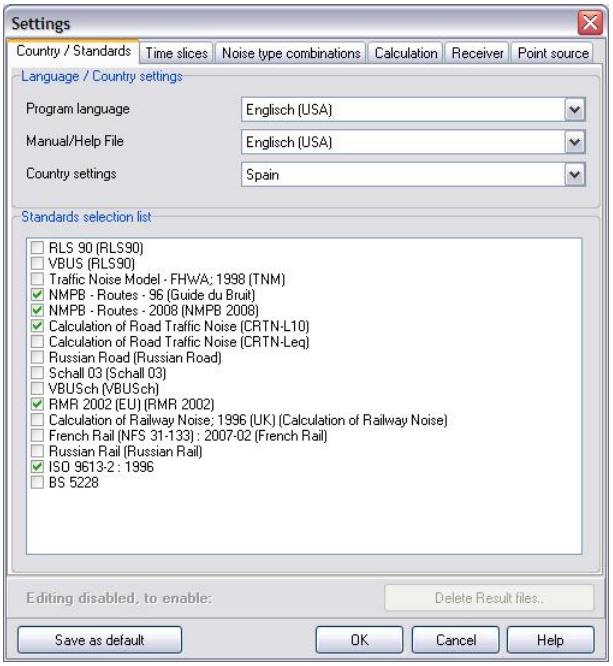
The SoundPLAN *essential* project must contain the noise combinations "road", "railway" and "road/railway". Additional combinations or additional emitters in the used combinations (e.g. "road/parking lot") do not interfere. Enter the geometry data and the emitters with the combination "road/railway" and calculate the total noise levels. Switch to the combination "road" or "railway" and calculate each noise type separately. The tables and maps then only contain the results of road or railway.

**Hint:** If you want to use the same geometry data for different planning variants, store the project with **FILE -> SAVE AS** under a new name.

## Change Country Settings and Standards

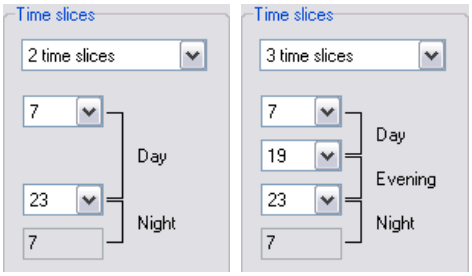
Program language, language of help file and manual and the country settings for the standards and time slices are set to defaults according to the language of the

operation system. You can change these settings if needed with the button standards and calculation settings, tab "*Country/standards*".




As soon as emission definitions or results are present, the settings for the noise type can only be changed, if you delete them using the buttons **DELETE EMISSION DEFINITION** or **DELETE RESULT FILES**.

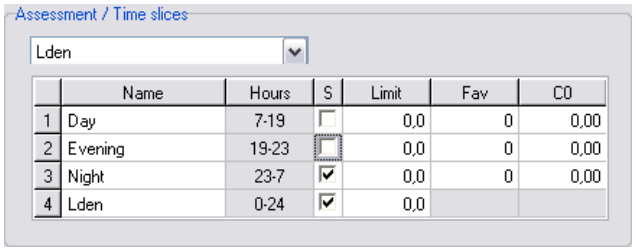
## Time Slices and Assessment




Select whether you need the emission definition and the assessment for 2 or 3 time slices and at which time the time slices day and night or day, evening, night begin. When selecting the assessment for three time slices additions are added for the evening (5 dB) and the night (10 dB) according to the noise index Lden.

Calculations with only industrial sources (see "Industry Noise" on page 25) can be assessed according to the day/night levels, the Lden noise indices or according to user defined time slices. ("TA Lärm" is an assessment according to German law.) Additionally the maximum level Lmax is calculated.

### *Limit Values and Standard Dependent Settings*




| | Name | Hours | S | Limit | Fav | C0 |
|---|---|---|---|---|---|---|
| 1 | Day | 7-19 | ☐ | 0,0 | 0 | 0,00 |
| 2 | Evening | 19-23 | ☐ | 0,0 | 0 | 0,00 |
| 3 | Night | 23-7 | ☑ | 0,0 | 0 | 0,00 |
| 4 | Lden | 0-24 | ☑ | 0,0 | | |

The project noise limits are used for the first receiver entered and are also used to draw the limit contour in the graphics display. A checkmark in the column labeled "**S**" determines, whether the time slice is displayed in the tables and in the graphics. If you calculate for example according to $L_{den}$ and only want to show the noise indices $L_{den}$ and $L_{night}$ but not the intermediate products $L_{day}$ and $L_{evening}$.

Standard depending settings: For calculations according to ISO 9613-2 enter the factor "C0" (for each of the time slice) for the calculation of the meteorological correction Cmet. For calculation with the French standards NMPB Routes 96, NMPB Routes 2008 and NFS 31-133 the percentage of favorable propagation conditions is needed, enter the value in the column "Fav."

## Save as Default

**SAVE AS DEFAULT** stores changes in the settings as default, so that new projects will have the correct settings and parameters.

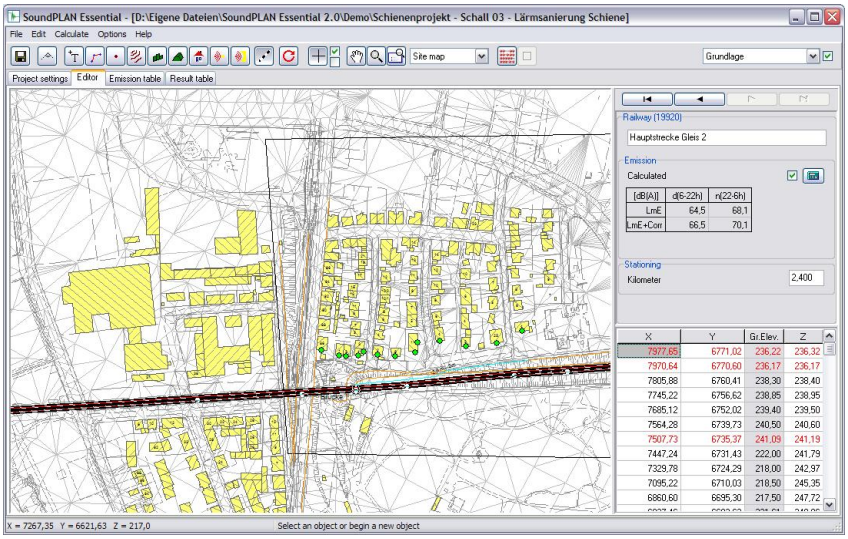
# Data Entry and Calculations

## General

The Editor manages the entry of all noise relevant data and geometry for your project and prepares the data for the calculation (single receivers, noise contour lines and grid noise maps). You can prepare the geometry data on the basis of a scanned and geo-referenced bitmap or by importing from DXF, ESRI Shapefile or ASCII files.

The elevation supply is capable of working with a digital ground model (DGM) and placing the objects on top of the triangulated surface.

SoundPLAN *essential* works with global Cartesian coordinate systems or a user defined local coordinate system. All units are metric [m].




The symbol bar contains symbols for entering the geometry, controls for zooming and editing, and symbols for selecting the background graphics.

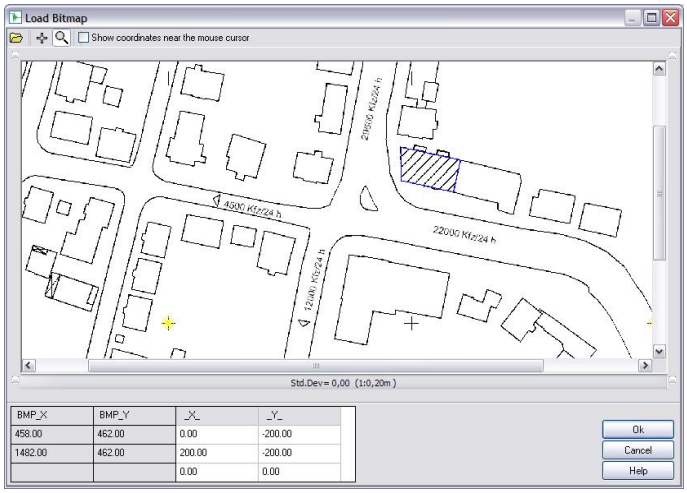
In the block on the right side of the graphical entry field, the properties and coordinates of the currently active object are listed. In case an object (i.e. elevation lines) does not contain properties, only the coordinate list is displayed.

### *Digitizing on Screen with Background Graphics*

Digitizing on top of scanned background graphics is the most common mode of data entry in this package unless the data are already present in a usable form in digital format. When scanning a map, please be advised that the resolution and especially the color depth should not be selected too high as the operation will slow down for very large graphics. You can use any number of background bitmap graphics in any of the formats BMP, JPG, PNG or TIF.

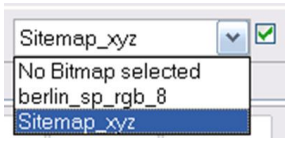
Background bitmaps must be used to establish the geo reference between the pixel formatted bitmap and the world or local coordinate system. If the bitmap already came with its geo-reference transformation, SoundPLAN *essential* will detect it and read the geo-reference file as soon as the file is opened.

Open **EDIT -> INITIALIZE** bitmap and open the scanned map.




The reference points should be as far apart as possible and should enclose the investigation area as much as possible. Enter world coordinates of the first reference point via the keyboard and then left click on the graphics to assign the location on the bitmap. To digitize more accurately, the first click opens an enlargement around the reference point so you can position the cursor more precisely and digitize again. Define the second reference point and click OK.

In the Editor you can switch between different background bitmaps and also temporarily deactivate a bitmap. With the click box next to the active bitmap, the current bitmap can be displayed or suppressed.

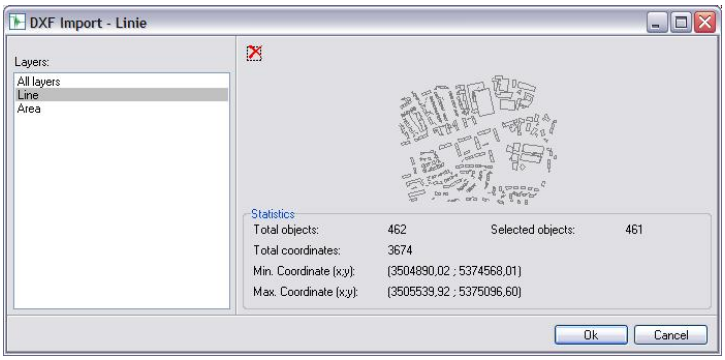



### *Import*

The model geometry can be imported in the formats of DXF, ESRI Shape file or ASCII. The objects must be organized in individual files (Shape files) or layers (DXF).

Activate the object type you want to import the data for. In the property declaration block you can assign default properties to the new objects so you won't need to manually define each value that might be covered by the default settings. Invoke the import via **FILE -> IMPORT** and select the format. Select the file and click OK. After importing, customize the properties of the imported objects.

As DXF files contain data of different object types, an additional window is supplied to select the appropriate layers for import. Use the shift key or the control key to mark multiple layers of the same object type for import. The assignment to the different layers is lost.




### *Digital Ground Model*

A Digital Ground Model (DGM) is the basis for creating a 3D SoundPLAN model. If you haven't calculated a DGM SoundPLAN *essential* automatically generates a DGM from the geometry data and interpolated outside positioned spot heights and uses it for the calculation.

The DGM is generated from elevation lines and spot heights. Enter the elevation data and then invoke the calculation of the DGM via the "abacus" symbol button (**CALCULATE -> CALCULATIONS)** and click **START**.

All objects that are now entered or imported are automatically placed on top of the DGM. If the DGM triangles are visible in the background, objects moved to a new location will automatically adjust to the elevation at the new location.

Deactivate the DGM triangles via **EDIT -> USE DGM**, if, for example, you want to create a wall parallel to a road or rail line and want to keep it the height of the parent object it was derived from.

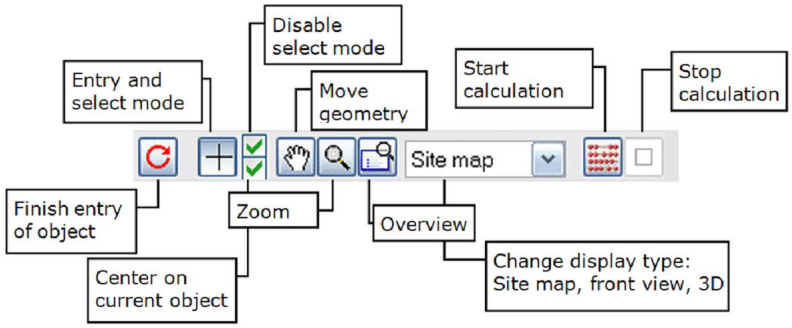
The terrain elevation can be assigned manually via **EDIT -> SET CURRENT OBJECT ON DGM** or **EDIT -> SET ALL OBJECTS OF CURRENT OBJECT TYPE ON DGM**. Check the model data in the 3D-plan view.

## Enter and Edit Objects and Object Properties

The coordinates of an object are entered via the mouse or via the keyboard in the coordinate list.

The mouse wheel is always available. "Turn mouse wheel" zooms the data, "keep mouse wheel pressed" moves the geometry. Additionally press the Ctrl-key to rotate the data.

The following symbol bar depicts the entry and edit functions in SoundPLAN *essential*:




To enter objects, the mode „select object or create new object“ must be active (the button is highlighted in this mode). If the crosshair cursor is close to another object, it will change its appearance into the „hand“ symbol to activate the object and display the coordinates and properties on the right side.

Even if a large bitmap is active in the background, you can still use the symbol button **OVERVIEW** to zoom out to the entire size of your investigation area. The program will maximize the already entered model. If you want to enter data outside the area, click on the "hand" symbol to move the view port or use the "magnifying glass" and right click to decrease the scale of the plan and thus move the extended area into view.

If the selection mode has problems digitizing new coordinates, deactivate the edit mode by un-checking the checkbox next to the „select object or create new object“ button.

End the data entry for the current object by double clicking or use the symbol button **CLOSE OBJECT** (F2). For buildings entered with the right angle mode, you can close the building with a double click at the third coordinate; the fourth coordinate will be set by the program and the building will be closed.

**Selecting an object:** If objects are stacked on top of each other and the wrong object type is activated, click on the symbol of the desired object type in the symbol bar. The active object type is always found first.

If you have started digitizing a new object but meant to activate an existing object, pressing the ESC key will delete the new object if it has not yet been closed.

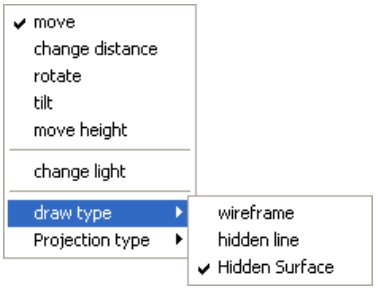
Use the navigation bar above the properties to move from object to object within the object type selected. Use this feature to check properties and coordinates of the objects.

If the checkbox "center to current object" is ticked, the geometry moves and the object is displayed in the middle of the screen.

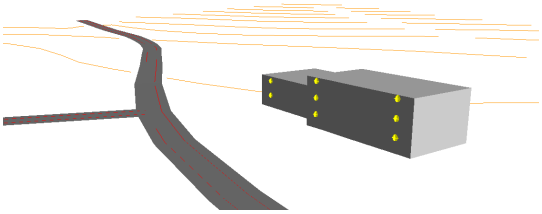
### *Presentation types*

You can display your geometry data as a projection or as a 3D-view to verify the model. You can move freely within the investigation area using the mouse wheel.

In the 3D-view use the right mouse button in the "hand mode" to select the various movements and view modifications.




Initially the **MOVE** mode is active. The modes used most often, „Change distance“ and „rotate and tilt“ are also available using the left mouse button with the Shift key and the left mouse button with the Ctrl key. The appearance of the cursor changes according to the active mode.



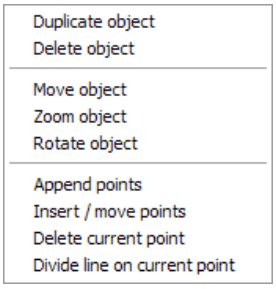
In the **CHANGE LIGHT** mode, the position of the light source is moved when the left mouse button is pressed and the cursor is moved across the screen.

For the **DRAWING TYPE**, select between wire frame model and hidden lines and surfaces and in the **PROJECTION TYPE** between orthogonal and perspective projection.

Select the **SITE MAP** display to continue with data editing.

### *Edit and delete objects*

Right click on an object to edit, move or delete it.



Right click on the object and then select the desired action. **DUPLICATED OBJECTS** are positioned at a slight offset to help with placing it. After duplication, select **MOVE OBJECT** to move it to its new position.

**APPEND POINTS** is only active for line type objects so additional coordinates can be digitized at the end of the object. Select **INSERT/MOVE POINTS** to move single coordinates or insert coordinates at the cursor position. The cursor will change to an arrow with a small „+" sign.

When objects are moved or rotated they are automatically re-referenced to the DGM. If the DGM is deactivated, the object elevation (z-coordinate) is not updated to conform to the new position.

Objects can also be deleted using the Ctrl+Del key after clicking on the object. Single coordinates are deleted in the graphics window by right clicking and selecting the option **-> DELETE SELECTED POINT**. It is faster, however, to delete a coordinate in the coordinate list using the DEL key.

**Divide line objects:** Go to the coordinate, where you want to divide the line with the right mouse button and select from the popup menu **DIVIDE LINE AT THE CURRENT POINT**. The new object gets the properties that are valid at the point where the object is divided. Lines can only be divided, if both line parts afterwards have more than 2 coordinates.

### *Coordinate list*

The coordinate list shows the x and y coordinates and depending on the object type the base height or the relative height. The terrain elevation of the objects is only displayed for information purposes but cannot be edited as it is either 0 or it is derived directly from the digital terrain model.

In the coordinate list you can:

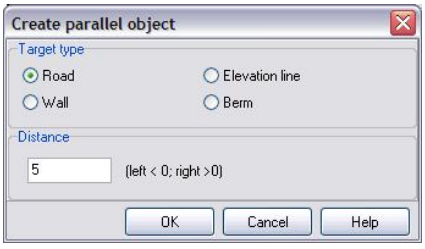
- correct x and y coordinates
- Enter the z coordinate for several points. (Keep the Shift-key pressed, highlight the points with the arrow keys and enter the value.)
- Insert coordinates with the right mouse button **-> INSERT POINTS**. The point is inserted in the middle of the two coordinates, the elevation between both points is interpolated. (This is for example useful to divide a wall in smaller, regular sections.)
- Delete coordinates (DEL key)
- Delete changes in the property definition within roads, railways, walls and berms (right mouse button -> **DELETE PROPERTES**).

If a line contains only a single coordinate after deleting, then the entire object is deleted. This is the same for areas having only 2 coordinates.

### *Parallel Line Object*

Generating a parallel line object is useful to generate a wall or berm parallel to roads or railways, a parallel second road or railway axis or elevation lines parallel to a road or railway axis.

Select the base object and invoke the command **EDIT -> PARALLEL LINE OBJECT**.



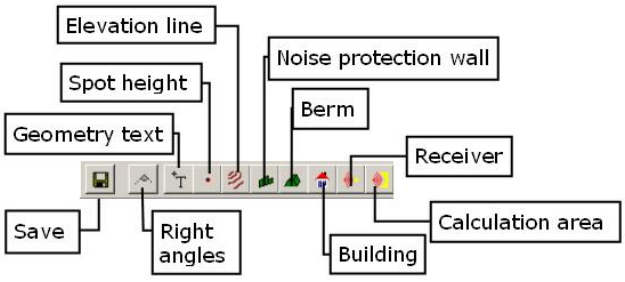

Select the target type (wall, berm, elevation line or the existing object type) and enter the distance for the new object. Values >0 will create a parallel line object to the right of the original and values <0 will create the parallel line object to the left of the original object as seen in the data entry direction.

Parallel roads or railways inherit the object properties from the original object.

If a DGM was calculated, both the new object and its terrain elevation are adjusted to the DGM as soon as the DGM triangles are visible on screen. If you want to generate the parallel object with the same z-component of the coordinates as the original, deactivate the DGM display with **EDIT -> USE DGM**.

## Objects for all Noise Types

Depending on the noise type, there are different or additional objects at your disposal to create the acoustical model. (For example ground effects for industrial noise.)

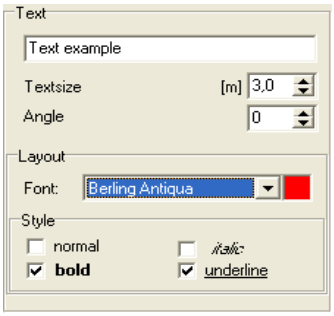



Click on the symbol button for the desired object and enter the coordinates.

**Hint:** As the object properties are always taken from the object last entered, it is advisable to enter similar or identical objects one after the other to avoid entering or modifying the descriptive properties over and over again.

| Object type properties | Description |
|---|---|

### Text




Customary standard parameters as are common in Windows programs.

### Line

No properties

You can for example import all lines from a DXF file to this object type and digitize the needed objects similar to digitizing them from a background bitmap. These lines could also be used in the graphics plot instead of a background bitmap.

Deactivate "select objects" when digitizing the objects.

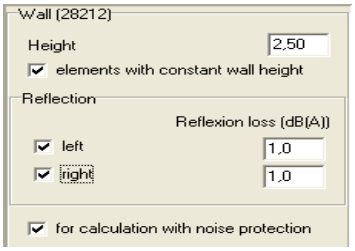
Hint: Should the lines be found first when you select objects, click on the symbol button of the object type you digitized and click on the objects using the navigation bar. If the lines disturb you after you finished digitizing the objects, you can deactivate them in **OPTIONS -> OBJECT TYPES** with the checkbox **SHOW IN EDITOR**.

### Spot height, Elevation line

No properties

Spot heights and elevation lines supply the DGM with elevation information. Via the DGM the average height of the line of sight above the terrain is calculated (ground effect) and the screening extra path length is evaluated.

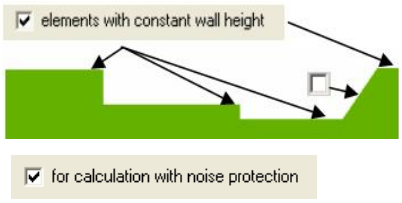
### Noise protection wall




A noise protection wall is described with the height of the screening edge above the base line. Even walls with the height of 0.0 meters can produce screening! The reflection loss to the right and left is set to be seen in data entry direction. According to the RLS-90 the following reflection losses can be taken as standard:

| Wall type | Reflection loss |
|---|---|
| Acoustically hard surfaces | 1 dB(A) |
| Absorbent noise protection walls | 4 dB(A) |
| Highly absorbent noise protection walls | 8 - 11 dB(A) |

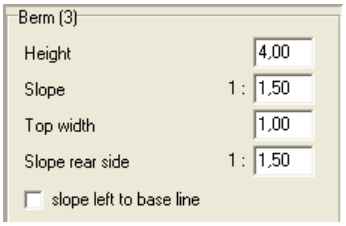
If you do not want the wall to be calculated as a reflective object, uncheck the reflection marks for the left and the right sides.




The height of the wall can change in the course of the wall. Click on the mark for **CONSTANT WALL ELEMENT** if you want to set a height jump at a certain coordinate.

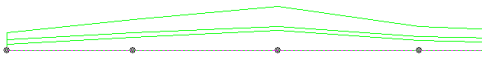
For the project type „Calculation without / with noise control“ you can also specify if the wall is a planned wall that is to be disregarded in the status quo calculation „without noise control.”

## Berm




Starting from the foot of the berm, the program will generate screening lines with the extra information of berm height, slope and top width.

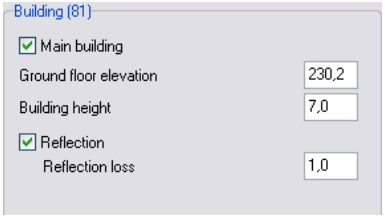
The properties can vary along the berm. If the parameters are changed, the program automatically adjusts the screening lines.



*For an entered berm base line (lowest line), the program calculates the screening lines and contours of the berm.*

For the project type „Calculation without / with noise control“ you can also specify if the berm is a planned berm that is to be disregarded in the status quo calculation „without noise control.”

## Building



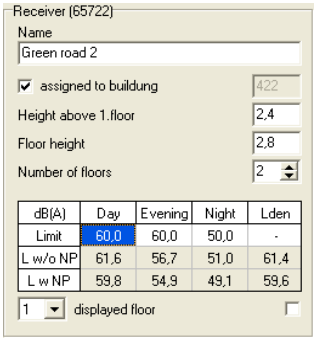

A building is described using the building reference plane (most often the elevation of the ground floor slab), height of the building above the building reference plane, and the reflection loss. (Reflection loss = 1 for smooth facades, loss = 2 for structured facades). If you do not want reflections to occur on a building, deactivate the checkmark **REFLECTIONS**.

Receivers and point sources can be assigned to the buildings.

Right angle mode (F11):

Corners of buildings form right angles and are calculated this way by default unless the right angle mode is deactivated. When entering buildings, it is advisable to start digitizing with the longest side. The right angle mode can be (de)-activated while entering a building.

## Receiver




Receivers are entered for the purpose of calculating single location receivers. The receivers can be located in the free field or attached to buildings. For receivers attached to buildings, the last reflection on its own building is suppressed. The calculation height (elevation) of the lowest receiver on a building is set by the coordinates of the bottom of the building plus the height entered in the field **HEIGHT ABOVE REFERENCE PLANE**. For free field receivers, the elevation entered for the receiver is the coordinate base. Via the field **NUMBER OF FLOORS**, any number of receivers for subsequent floors is calculated. The spacing between the receivers is set in the field **FLOOR HEIGHT**.

If a receiver is in the vicinity of a building, the cursor changes to the Capture Cursor. You can decide where to locate the receiver within the capture radius.

Capture-Cursor:

Alignment of receiver
Align receiver to building and center to facade
Align receiver to building
Do not align reciever to building
Use selected setting and do not show selection window again
OK
Cancel

After calculation, the noise level for the selected „main“ floor is presented. For the project type „Calculation without / with Noise Control“ both levels are presented. If the box to the right is checked, a level chart is also presented in the editor.

Default settings for the receivers and the description of the floors can be changed via **OPTIONS -> SETTINGS**, tab "*receivers*".

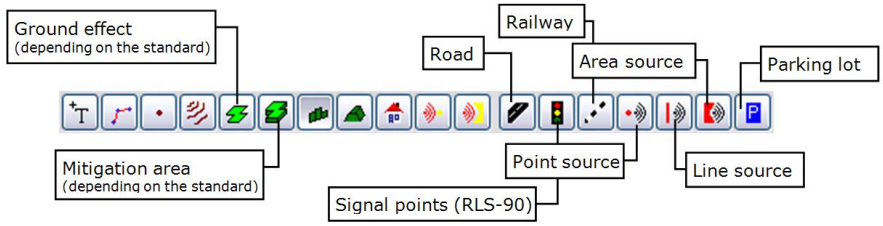
"Use rest hours" is a special checkbox for calculations according to the German TA Lärm.

## Calculation area

No properties

The calculation area is used for calculating noise limit contour lines and for grid noise maps. If no calculation area is present, the area is set by the min/max coordinates of all objects. This may lead to longer calculation times because the area may be bigger than needed.

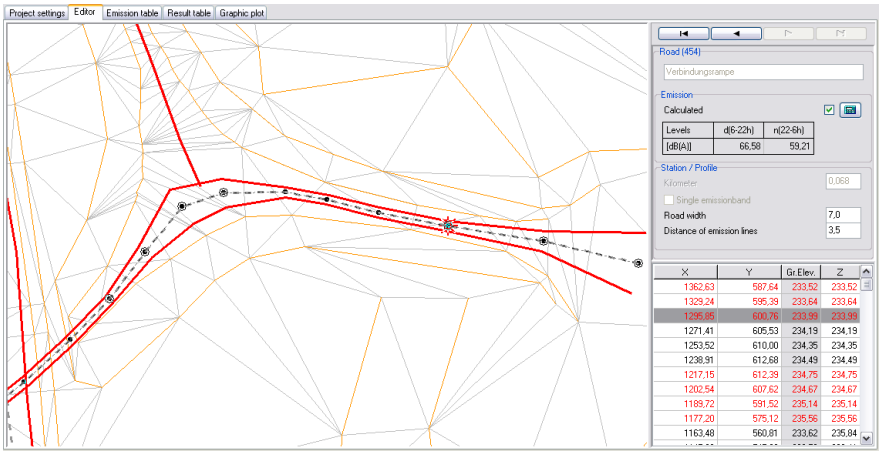
## Objects for the Different Noise Types




## Road Noise

Enter the road and define the emission. The reference elevation is the top of the roadway. The program sets the emission band to 50 cm above the road surface.

The road properties can change during the course of the road (width or emission level). The coordinates in the coordinate list where the properties change are marked in red. In the editor-graphics, those coordinates are marked with small double circles.

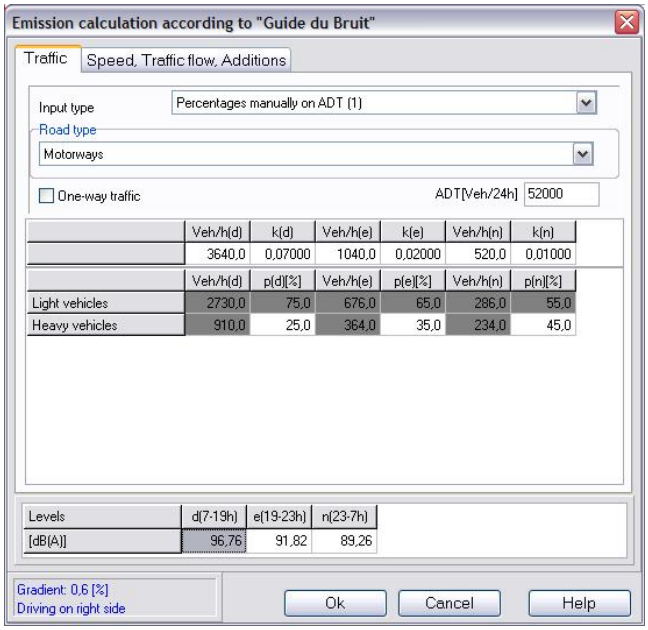



Enter the road width (for the graphical display and hard ground definition) and the distance of the emission bands so the program can distribute the emission between the 2 emission bands (for RLS-90 - for other regulations different positions apply). Click on **SINGLE EMISSION BAND** at the first coordinate if the entire emission is to be placed on a single source line (i.e. for one way streets).

The **KILOMETER** marker is available to document the change in emissions related to the kilometer/mile post. The kilometer marker can only be assigned to the first coordinate of the road.

### *Emission Calculation Road*

Click on the pocket calculator to compute the emissions from the parameters of traffic volume, road surface and speed. Some standards allow entering already calculated emission levels directly into the fields.




The data for the composition of the traffic can be provided as an average daily traffic (ADT) and the percentages for each of the time slices (e.g. for RLS-90 - input type "percentages manually on ADT") or as traffic data per hour (input type "Veh/h direct entry").

Entries for "Veh/h direct entry":

Vehicles/h: hourly traffic volume for each time slice and each vehicle type or the percentages of each vehicle type referring to the total traffic volume.

Entries for "Percentages manually on ADT":

ADT[vehicles/24h]: average daily traffic

k: Factors to calculate the hourly traffic volume from the ADT: k*ADT=vehicles/h for the given time slice

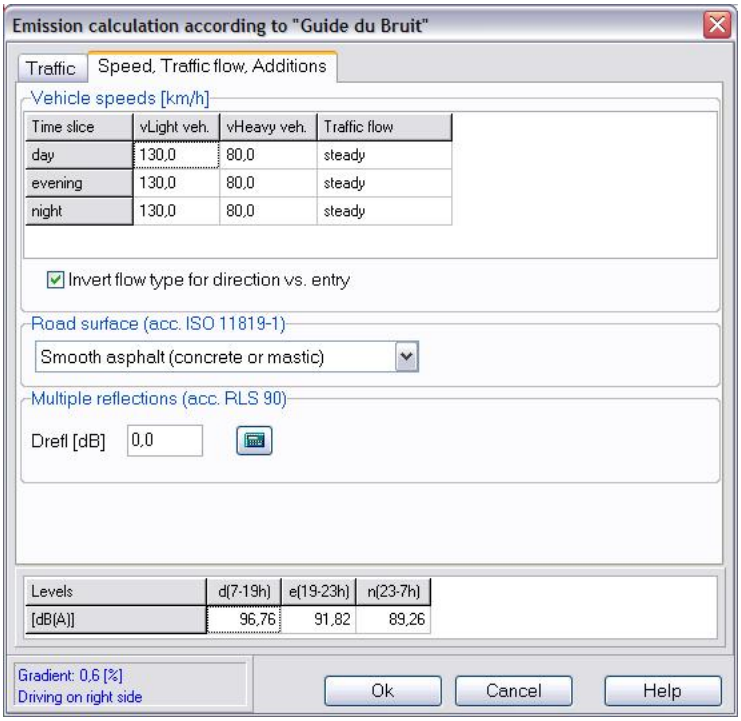
p[%]: Prozentuale Anteile der Fahrzeugarten (Lkw-Anteil) an der gesamten Verkehrsmenge im jeweiligen Zeitbereich.

For Germany default settings for the factors k and the percentage of heavy vehicles come from the road types of the RLS-90. Additional road types are derived from traffic censuses.

The field **ONEWAY TRAFFIC** is only relevant for standards that have different values for the incline addition for vehicles going uphill/downhill.

### Speeds and Road Surface Addition

Enter other components of the emission level in the tab "*Speed, surface,*" which are different depending on the used standard.




Enter the **SPEED** for the different vehicle types and time slices in [km/h].

For most of the standards this is the permissible speed (e.g. RLS-90, NMPB, Russian road), but it can also be the average speed (CRTN) or the actual speed (RTN Nordic 1996, ASJ).

The **TRAFFIC FLOW** is considered differently, in most standards with the conditions accelerated, decelerated, and steady. TNM uses the kind of measure (stop sign or traffic light) and the percentage of affected vehicles. The RLS-90 uses separate signal points at traffic lights.

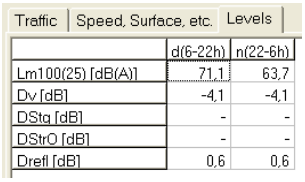
The **ADDITIONS FOR THE ROAD SURFACE** are different for each standard, too. Additions that are dependent on speed are automatically tallied. You can also define a road surface with a corresponding addition not listed with the selection **OWN SETTINGS**. The NMPB additionally takes the age of the road surface into account.

In the RLS-90 **MULTIPLE REFLECTIONS** in street canyons are accounted for by means of an addition to the emission noise level (Drefl). The propagation calculation then must be limited to the first reflection. Enter the mean height of the walls on the lower side of the street canyon (hBldg[m])), the distance between the left and the right side and a reflection factor to accommodate for

the hardness of the walls (absorbent for absorbing walls and reflecting for walls with little absorption).

The **INCLINE** itself is normally calculated from the geometry, but you can manually set an incline value. The incline addition is evaluated automatically at calculation time. It depends on the standard from which percentage on an addition for the incline is evaluated. According to RLS-90 for example only if the incline is bigger than 5%. Some standards distinguish between the uphill and downhill direction for the incline addition (e.g. CRTN). For your information the incline in [%] is displayed on the lower left hand side in blue writing.

The table in the tab "*level*" shows the emission level including the additions.




| | d(6-22h) | n(22-6h) |
|---|---|---|
| Lm100(25) [dB(A)] | 71,1 | 63,7 |
| Dv [dB] | -4,1 | -4,1 |
| DStg [dB] | - | - |
| DStrO [dB] | - | - |
| Drefl [dB] | 0,6 | 0,6 |

The emission level of the roads is documented in the tab "*emission table*".

### *Signal Addition RLS-90*

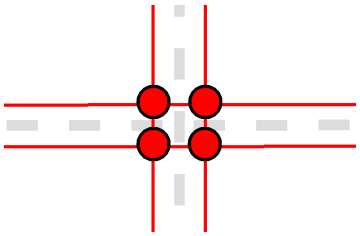
The signal addition accounts for the increased annoyance at intersections. This addition, according to the RLS-90, is given for the entire road depending on the distance to the traffic signal. It is not an addition to the emission level.

Depending on the distance of the receiver to the traffic signal, the contribution of the section of road is increased by a margin of 1 to 3 dB(A).

The addition is given when the receiver is located at certain distances from the intersection of roads crossing each other. The nearside lanes of both roads must be less than the distance given in the table below:

| | | | | | |
|---|---|---|---|---|---|
| | 0 m | to | 40 m | => | + 3.0 dB(A) |
| from | 40 m | to | 70 m | => | + 2.0 dB(A) |
| from | 70 m | to | 100 m | => | + 1.0 dB(A) |

Define the signal markers at the intersections of the outer lanes (emission lines) of both roads. From these positions, the 3D distance to the receivers is calculated and the signal addition allocated.



For T-type junctions you should mark the area with 4 signal markers.

## Parking Lots

### *Parking Lots - RLS-90*

Enter the corners of the parking lot and define the traffic volume. The reference elevation is the elevation of the parking lot. The emission default is 50 cm above the parking lot surface.

The traffic volume of the parking lot is entered with the number of moves per parking bay (in and out are each considered a single move), the hour (for the time slices day and night) and the number of parking bays.

Via the **PARKING LOT TYPE ADDITION** different emissions for different parking lot types are accounted for:

| | |
|---|---|
| Car parking lot | 0 dB |
| Motorcycle parking lot | 5 dB |
| Truck- and bus parking lot | 10 dB |

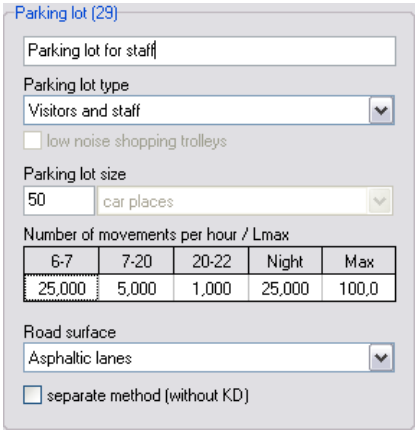
The emission level of a parking lot is automatically increased by the values set in the parking lot type. Additionally, "own values" allows the entry of custom declared values.

The result of the emission calculation is the LmE, the total noise level of the entire parking lot with a reference distance of 25 meters. The emission calculation of the parking lot is documented under the tab "*Emission table*".

### *Parking Lot - Parking Lot Study 2007*

The 6th revised edition of the parking lot study “Recommendations for the Calculation of Sound Emissions of Parking Areas, Motorcar Centers and Bus Stations as well as of Multi-Storey Car Parks and Underground Car Parks” published by the Bavarian Landesamt für Umwelt provides calculation methods to determine the emissions of parking lots.

The emissions depend from the types of vehicles, the number of parking movements, the behavior of the parking users and other noise on the parking lot (e.g. rattling of the shopping trolleys).



**Parking lot type and parking lot size**

The study paper distinguishes between different parking lot types, taking into account the different uses and vehicles; details can be found in the study paper.

Parking lots at shopping centers, restaurants and hotels are defined with the reference units "net sales area", "net restaurant area" or "number of beds". The number of parking bays is calculated according to a formula from the parking lot study. If you have a more accurate knowledge about the parking moves, you can change to the reference unit "number of parking bays". For shopping centers, the usage of low noise shopping trolleys can be taken into account.

The traffic volume of the parking lot is entered with the number of moves for each of the time slices for the entire parking lot and the number of parking bays. (Summed up for the time slice and divided by the number of hours).

***Into a parking bay and out of a parking bay = 2 parking moves***

**Road surface**

The selection of the road surface (surface of the lanes not of the parking bays) determines the addition $K_{StrO}$. These are different from the additions of the RLS-90.

**Separate method (without KD)**

With the lane addition, the traffic within the parking lot is calculated using the number of parking bays and moves as long as you use the normal case "integrated method".

The emission calculation of the separated method (special case) doesn't include the traffic on the parking lot. Therefore it must be modeled separately as a line source or a road using the emission calculation of the RLS-90. This method should only be used for very big parking lots or if the total parking lot is separated into several parts.

**Addition for KI (impulse addition - German method)**

An impulse addition is evaluated, if the box **USE KI FOR PARKING LOT** is checked in **OPTIONS -> SETTINGS**, tab "*calculation settings*" (default only for Germany). The addition depends on the parking lot type and if the lanes within the parking lot are included.

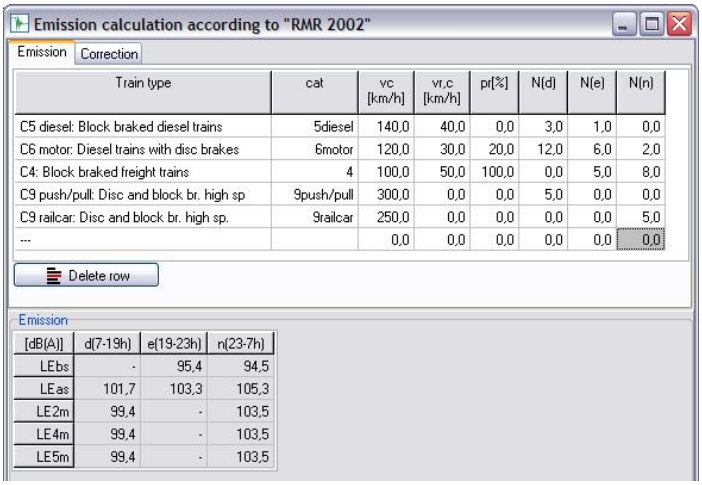
## Railway Noise

Enter the railway axis and define the emissions. The noise will be emitted from the position of the railhead. The emission heights are calculated automatically.

The properties of railways (train numbers and types, corrections) can vary along the train line. The coordinates in the coordinate list where the properties change are marked in red. In the editor graphics, those coordinates are marked with small double circles when the railway line is activated.

### *Emission Calculation for RMR 2002*

The dialog has the two tab index cards "emission" (railway traffic data) and "correction" (track specific corrections).


Emission calculation according to "RMR 2002"
Emission
Correction
Train type
cat
vc [km/h]
vr,c [km/h]
pr[%]
N(d)
N(e)
N(n)
C5 diesel: Block braked diesel trains 5diesel 140,0 40,0 0,0 3,0 1,0 0,0
C6 motor: Diesel trains with disc brakes 6motor 120,0 30,0 20,0 12,0 6,0 2,0
C4: Block braked freight trains 4 100,0 50,0 100,0 0,0 5,0 8,0
C9 push/pull: Disc and block br. high sp 9push/pull 300,0 0,0 0,0 5,0 0,0 0,0
C9 railcar: Disc and block br. high sp. 9railcar 250,0 0,0 0,0 0,0 0,0 5,0
--- 0,0 0,0 0,0 0,0 0,0 0,0
Delete row
Emission
[dB(A)] d(7-19h) e(19-23h) n(23-7h)
LEbs - 95,4 94,5
LEas 101,7 103,3 105,3
LE2m 99,4 - 103,5
LE4m 99,4 - 103,5
LE5m 99,4 - 103,5

Double click on the field **TRAIN TYPE**, select a train category, suitable for the train type from the selection list and enter the mean speed non-braking trains vc [km/h]. Please look at the RMR for further information on the train categories.

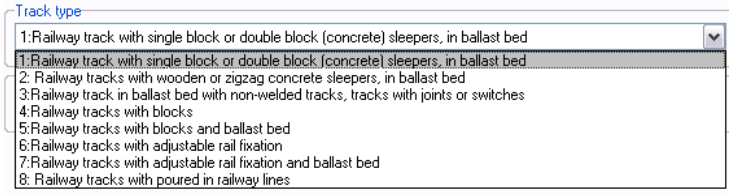
Enter the percentage of braking trains in train stations (pr [%]) and the mean speed of the braking trains vr,c[km/h]. To finish the emission entries enter the number of train units, i.e. carriages or engines for the time slices day, evening and night.

The emission table shows the emission level (mean sound power per meter) for all frequencies, emission heights and time slices. The RMR distinguishes between five emission heights above rail head: 0 m (bs), 0.5m (as), 2m, 4m, 5m.

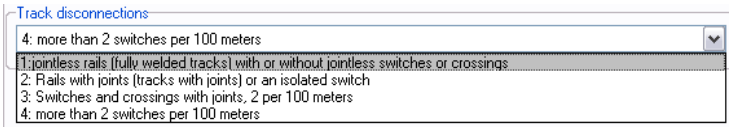
Depending on the train category, the emission is not defined for all emission heights.

### Track data

Definitions for the track type (bed, sleepers)


Track type
1:Railway track with single block or double block (concrete) sleepers, in ballast bed
1:Railway track with single block or double block (concrete) sleepers, in ballast bed
2: Railway tracks with wooden or zigzag concrete sleepers, in ballast bed
3:Railway track in ballast bed with non-welded tracks, tracks with joints or switches
4:Railway tracks with blocks
5:Railway tracks with blocks and ballast bed
6:Railway tracks with adjustable rail fixation
7:Railway tracks with adjustable rail fixation and ballast bed
8: Railway tracks with poured in railway lines

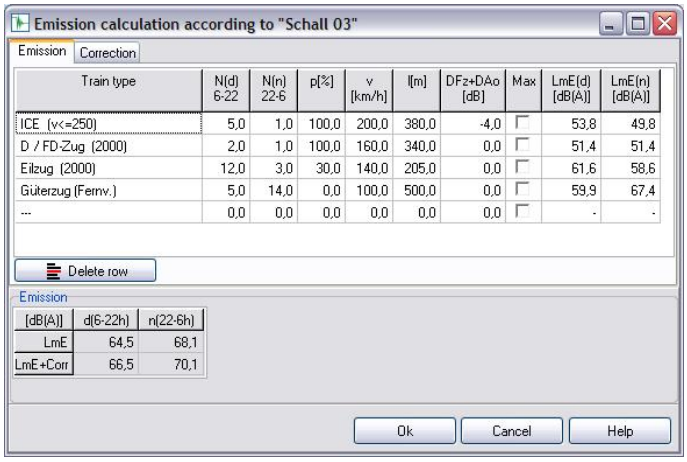
and track disconnections (switches, crossings) are necessary.


Track disconnections
4: more than 2 switches per 100 meters
1:jointless rails (fully welded tracks) with or without jointless switches or crossings
2: Rails with joints (tracks with joints) or an isolated switch
3: Switches and crossings with joints, 2 per 100 meters
4: more than 2 switches per 100 meters

### *Emission Calculation Schall 03*

Click on the pocket calculator to calculate the emission from the trains or engines and wagons and track specific corrections. You can enter already calculated emission levels directly into the fields in the emission dialog.

**Traffic data**

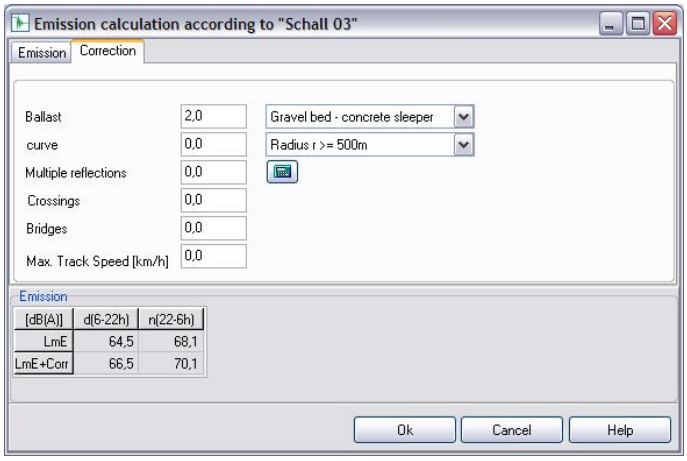



Select the train types (double click on the cell "train type") and the number of trains in each of the time slices and check the default properties such as disk brake percentage (p[%]), speed, train length and train type corrections.

In train stations, the railway company suggests to continue using the speed on the regular rail line. To compensate for this, the railway bonus also applies in the station.

**Track specific corrections to the emission level**

The track specific corrections are defined under the tab "*Corrections*". This tab is also available when the emission level was set rather than computed.



**TRACK AND CURVE CORRECTIONS** are selected from the specifications of the standard.

The correction for **LEVEL CROSSINGS** must be defined for a section of twice the road width and must be set to an addition of 5 dB. Further additions for the track must not be set.

**MULTIPLE REFLECTIONS** in narrow canyons are accounted for with the addition DRefl. The propagation calculation then must be limited to the first reflection. Enter the mean height of the walls on the lower side of the street canyon (hBldg[m])), the distance between the left and the right side and a reflection factor to accommodate for the hardness of the walls (*absorbent* for absorbing walls and *reflecting* for walls with little absorption).

The influence of **BRIDGES** in the planning process is accounted for with an addition of 3 dB for the track portion on the bridge. For existing bridges, this addition may be verified with a noise measurement.

## Industry Noise

## Calculation Standard ISO 9613-2

Normal mode:

- Noise sources must be entered with the sound power in octave or third octave bands.
- A ground absorption area must be defined (otherwise the program will assume soft ground).

Alternate mode:

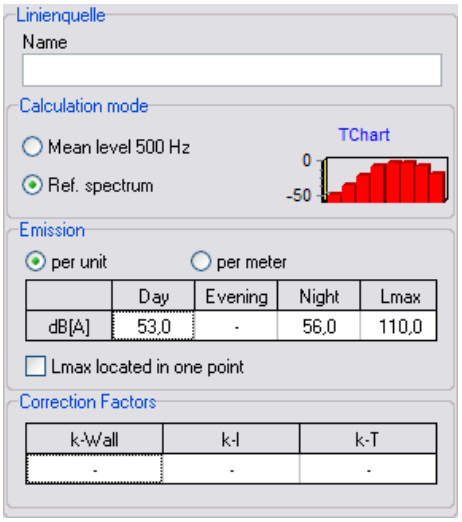
- No ground absorption area is needed.
- Calculation for a single mean frequency (for example 500 Hz) or with a spectrum.
- The **ALTERNATIV GROUND EFFECT (FOR ISO 9613-2)** must be checked in the tab "calculation settings" (**OPTIONS -> SETTINGS**).
- Sources entered with a single value A-level are automatically calculated according to the alternate calculation mode. The program dispatches a warning message if the alternate mode of calculation is used.

### *Properties of the Sources*

The sources of industry noise represent point, line and area type emitters. The sources are described with coordinates x, y, and a relative height above the terrain. The ground effect is influenced by the height of the source above the terrain.

Area sources may have any orientation in space. The only requirement is that they form a single plane. However, small deviations from the plane are adjusted by the triangulation process. If sources do not form a plane, you must subdivide your area sources. Area sources can be vertical.

The sound power can be entered as a single value A-weighted sum level (mean frequency 500 Hz) or via a spectrum. If you enter a spectrum, the program will treat this as a **reference spectrum**. The sound power of the source needs to be entered into the table for the individual time slices. You can copy the spectra from Excel or the SoundPLAN library, see "Reference spectrum" on page 27.




For line and area sources, the sound power can be present per **METER** or **UNIT**. If the **UNIT** setting is used, the emission is set as the total sound power. This results in an even distribution of the sound power over the entire line/area of the source.

If the level entry per **METER** is used, the total emission level is defined as the length-related or area-related sound power level. The longer the line source or bigger the area source, the bigger the magnitude of the total sound power. The total sound power level of the source is the defined emission level plus 10*log(size of the source).

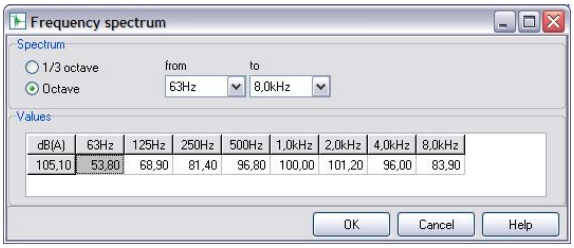
### Correction factors

Enter the correction factor kΩ wall for sources attached to walls and the additions for impulse and tonality. The value for kΩ ground is automatically accounted for in accordance to the ISO 9613.

For sources attached to walls (quarter sphere) an addition of 3dB is given. The reflections are suppressed on the wall where the source is located. For point sources assigned to buildings, the kΩ wall is set to 3 dB. The restriction of transmission into an eighth sphere can be simulated by assigning a kΩ wall of 6 dB if the source is located directly in the corner. SoundPLAN assigns sources in the eighth sphere, not exactly located in the corner to the wall where they are located (kΩ wall = 3 dB, the reflection of the assigned wall is suppressed). The higher sound radiation of the eighth sphere results from the contribution level of the reflected sound at the other wall.

### Reference spectrum

You can enter the reference spectrum manually or copy it from an Excel spreadsheet or the SoundPLAN library (demo version). Please check that the defined minimum and maximum frequencies of the copied spectrum coincides with the definition in SoundPLAN *essential*.



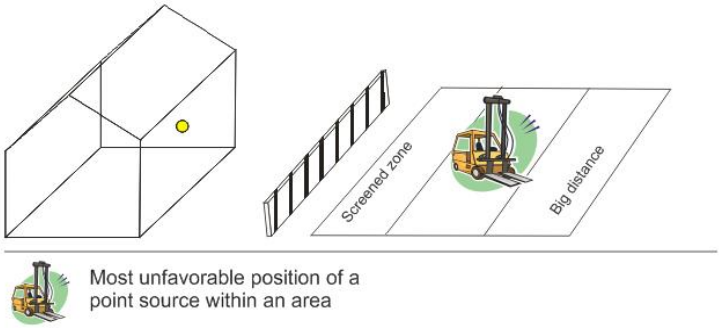

**To copy a spectrum from the SoundPLAN demo version:**

Open SoundPLAN and click on the library symbol. Open **LIBRARIES -> SYSTEM -> EMISSION** and select a spectrum. Copy the spectrum with command Ctrl+ C and select **CURRENT LINE** in the next screen. Go back to SoundPLAN *essential*, click on **SPECTRUM**, adjust the value range to the range of the copied data, and paste the spectrum with Ctrl+ V.

### Maximum level Lmax

SoundPLAN *essential* is capable of calculating the maximum noise level caused by one or more sources at the receiver. If multiple sources are present in the calculation, the program assumes that the maximum noise level is caused by a single source.

The program will use the same emission spectrum as for the Leq calculation. For point sources, the Lmax depends only on which source produces the highest noise level within the time slice. For line and area sources you can also calculate a spatial maximum level if the checkmark **LMAX LOCATED IN ONE POINT** is activated.




As shown in the sketch above, the maximum noise level of an area source is caused by moving the entire sound power to the spot on the line/area that produces the highest noise levels. SoundPLAN *essential* determines the worst possible position and the corresponding maximum level.

### *Ground Effect*

With the ground effect, areas of similar ground type are described (acoustically-absorption/reflection properties).

The ground factor G is defined as follows:

| | |
|---|---|
| G = 0 | Hard ground. Asphalt, concrete, pavement, water, presence of very many scattering objects close to the ground, industrial sites |
| G = 1 | Soft ground. Agricultural areas with or without crops and all ground types where something is growing or can grow (forest, grassland, garden areas) (default setting) |
| G = p/100 | Partially soft, partially hard ground. If a percentage is hard and the rest is soft, the factor G should be derived by interpolation between the hard and the soft part. |

Areas not described by ground absorption areas will be absorbent, with an absorption factor of (G = 1) by default. Therefore only hard surfaces and partially hard surfaces need to be digitized.

### *Mitigation Areas*

The first row of buildings should always be simulated with buildings so the reflective properties from the other side can be simulated properly. Areas behind the first row can be simulated either by entering the buildings or by mitigation areas. Stacking different areas with different heights is also a possibility.

The attenuation D is evaluated according to the formula:

$$D = f \times S_G$$

SG Distance the noise travels within the mitigation area [m]

f Mitigation factor [dB/m]

The distance SG used for the calculation is measured along an arc of 5 km radius stretched between source and receiver. If there are solid objects like buildings and screens between the source and the receiver, the parts between the top of the screens/buildings are also simulated with an arc.

If a search beam passes through multiple mitigation areas, the total attenuation by multiple mitigation areas is calculated as:

$$D_G = \sum_{i=1}^{n} f_i \times S_{Gi}$$

DG Total attenuation

fi x SGi Attenuation area i

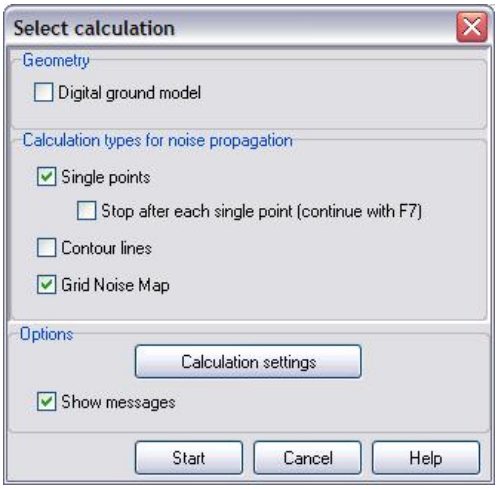
Select the area type from the area type industrial site, forest or building attenuation. The effective height is the height of the buildings or forest. The ISO 9613 uses an attenuation spectrum depending on the area type.

## Calculation

SoundPLAN *essential* calculates single receivers, noise limit contour lines and grid noise maps.

*Calculations*

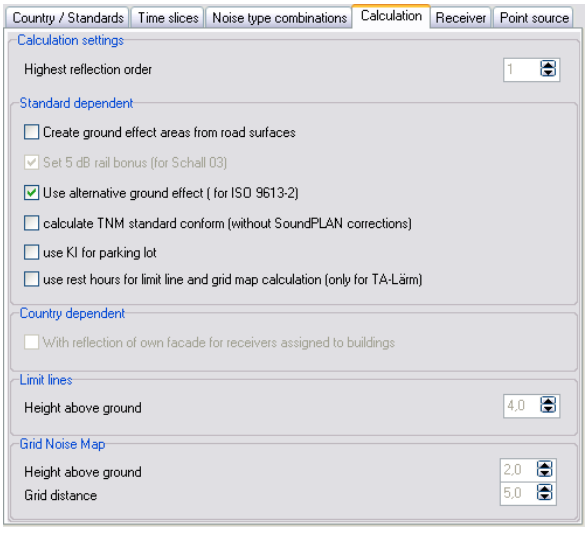
Click on the abacus symbol (or **CALCULATE -> CALCULATIONS**) and select what is to be calculated.




Calculation types are active only when data are present. If no single receivers are defined, for example, this calculation type is not available.

For the project type without / with noise control, select the variant you want to calculate.

### *Calculation Settings*




The default for the calculation settings depends on the selected country. Click on **CALCULATION SETTINGS** and check the standard and country depending settings.

Side diffraction is automatically taken into account as soon as a standard defines how to calculate side diffraction.

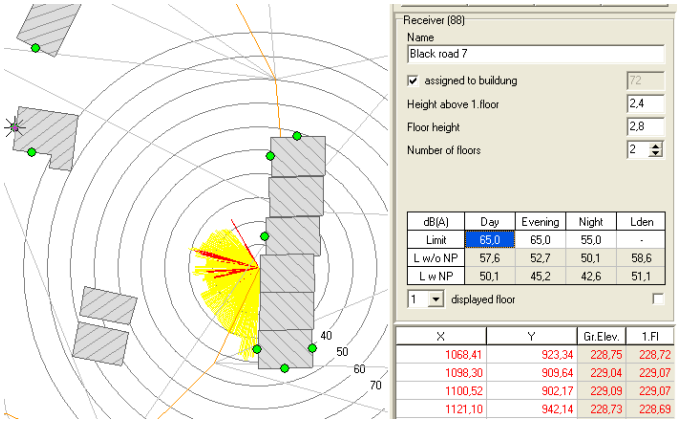
The **CALCULATION SETTINGS** also include general settings such as the maximum reflection order and settings for the limit map and the grid noise map.

### *Calculation Types*

Details on the calculation of the **Digital Ground Model** -> See „Digital Ground Model“, page 8.

The calculation type **single receivers** calculates the assessment levels for all receivers and floors and stores the results for each receiver. During the calculation, a level chart is presented depicting the magnitude of the noise received from each angular segment. Via the checkbox at the receiver, the level chart can appear later on so you can check the geometry and noise intake.

The level chart enables you to graphically check the single receiver calculation. The rays in the diagram depict the noise coming to the receiver from a certain direction (red rays show reflected noise). The length depicts the magnitude. The total noise level can be derived by adding the contributions of all depicted rays.




When **STOP AFTER EACH SINGLE POINT** is checked, level chart and result are visible on screen for validation purposes. Click **F7** to calculate the next receiver.

The results of single receiver calculations are located in the receiver table and can be presented in the site map in the graphics display as a little table for each receiver.

You can also calculate a single receiver in the free-field or attached to a building using **ctrl + right mouse button**. The receiver is not entered in the receiver table. The main purpose for this shortcut is to find the area where infringements of the noise limits can be expected, which means a grid noise map needs to be calculated.

The calculation type **noise limit contour line** is based on a grid noise calculation with a grid spacing of 5 meters, and presents the noise limit contour line for all time slices. The noise limit is defined in the project settings. Reflections in close proximity to the receivers are suppressed so the contour lines coincide with the

single receiver calculation. The limit contour line is presented in the graphics section on top of the site map. The formatting is via **GRAPHICS -> OBJECT TYPES**.

The calculation type **Grid Noise Map** shows all noise contours and fills the areas between contour lines. Open the calculation settings to enter the grid spacing and the calculation elevation above the terrain. The grid noise maps are presented on their own maps in the graphics according to a user controlled scale.

The limit noise contour line and the grid noise map are calculated for the entire calculation area or if you have not defined a calculation area, they are calculated for a rectangle covering the entire geometry.

*Abort calculation*

When calculating the limit contour line and grid noise maps, the program presents statistics showing how long the calculation will take. The statistics can be deactivated via the menu **CALCULATIONS -> SHOW GRID STATISTICS**.

**Abort calculation:** Click on the button "Abort calculation" to stop a running calculation, if necessary.

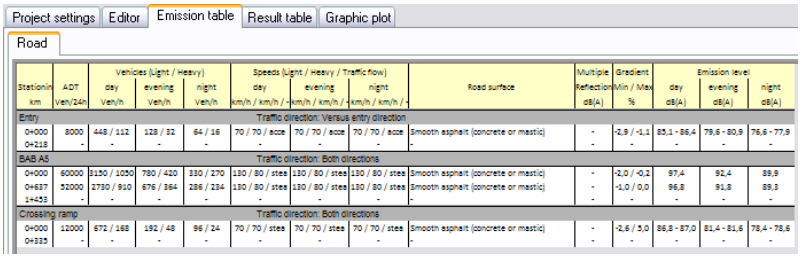
### *Calculation Messages*

During the calculation, the editor dispatches messages in the lower portion of the screen. Errors and warning messages are presented in red. Please check the geometry as soon as an error message appears. Double clicking on the message will open and activate the object in question so it can be fixed easily. If the error message indicates that the geometry must be altered, please keep in mind that you must right click on the object to open the menu to allow coordinates of this object to be moved or the object to be moved / rotated as a complete object.

## Table Type Documentation of Emissions and Results

The emission level calculations and the results of the noise propagation are both presented in tabular form in predefined tables. Click on the tab for Emission Tables and Result Tables.

The emission table documents the emission of the particular sources, depending on the type of noise source.

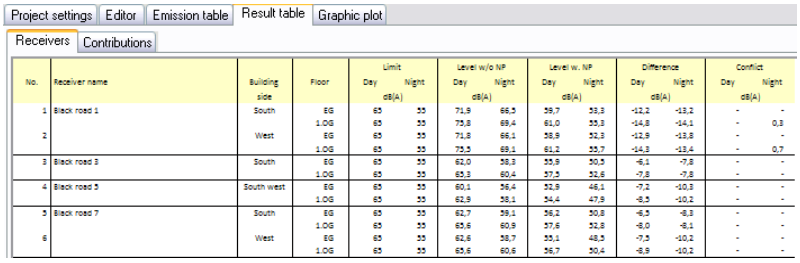

Project settings | Editor | Emission table | Result table | Graphic plot

Road

| Station in km | ADT Veh/24h | Vehicles (Light / Heavy) day Veh/h | evening Veh/h | night Veh/h | Speeds (Light / Heavy / Traffic flow) day km/h / km/h / - | evening km/h / km/h / - | night km/h / km/h / - | Road surface | Multiple Reflection dB(A) | Gradient Min / Max % | Emission level day dB(A) | evening dB(A) | night dB(A) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Entry | | | | | Traffic direction: Versus entry direction | | | | | | | | |
| 0+000 | 8000 | 448 / 112 | 128 / 32 | 64 / 16 | 70 / 70 / acce | 70 / 70 / acce | 70 / 70 / acce | Smooth asphalt (concrete or mastic) | - | -2,9 / -1,1 | 85,1 - 86,4 | 79,6 - 80,9 | 76,6 - 77,9 |
| 0+218 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| BAB A5 | | | | | Traffic direction: Both directions | | | | | | | | |
| 0+000 | 60000 | 3150 / 1050 | 780 / 420 | 330 / 270 | 130 / 80 / stea | 130 / 80 / stea | 130 / 80 / stea | Smooth asphalt (concrete or mastic) | - | -2,0 / -0,2 | 97,4 | 92,4 | 89,9 |
| 0+637 | 52000 | 2730 / 910 | 676 / 364 | 286 / 234 | 130 / 80 / stea | 130 / 80 / stea | 130 / 80 / stea | Smooth asphalt (concrete or mastic) | - | -1,0 / 0,0 | 96,8 | 91,8 | 89,3 |
| 1+453 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Crossing ramp | | | | | Traffic direction: Both directions | | | | | | | | |
| 0+000 | 12000 | 672 / 168 | 192 / 48 | 96 / 24 | 70 / 70 / stea | 70 / 70 / stea | 70 / 70 / stea | Smooth asphalt (concrete or mastic) | - | -2,6 / 5,0 | 86,8 - 87,0 | 81,4 - 81,6 | 78,4 - 78,6 |
| 0+335 | - | - | - | - | - | - | - | - | - | - | - | - | - |

The result table contains the results of the propagation of single receiver calculations. In addition to the noise levels, the limit infringement is presented in the columns labeled "conflict," and for 2 variants (without/with noise control) also the difference between them is shown. Under the tab for "*contributions*", the contributions of each source object are listed. The spectra at the receivers

are documented in the tab "*Spectra*" for industry sources defined with a spectrum.

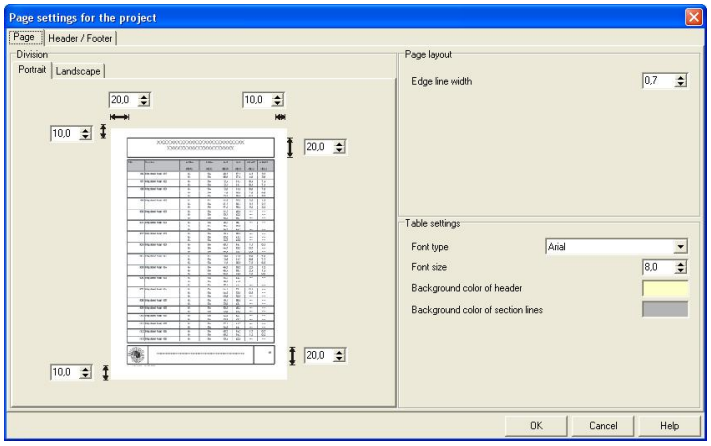



| No. | Receiver name | Building side | Floor | Limit Day | Limit Night | Level w/o NP Day | Level w/o NP Night | Level w. NP Day | Level w. NP Night | Difference Day | Difference Night | Conflict Day | Conflict Night |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | dB(A) | | dB(A) | | dB(A) | | dB(A) | | dB(A) | |
| 1 | Black road 1 | South | EG | 65 | 55 | 71,9 | 66,5 | 59,7 | 53,3 | -12,2 | -13,2 | - | - |
| | | | 1.OG | 65 | 55 | 75,8 | 69,4 | 61,0 | 55,3 | -14,8 | -14,1 | - | 0,3 |
| 2 | | West | EG | 65 | 55 | 71,8 | 66,1 | 58,9 | 52,3 | -12,9 | -13,8 | - | - |
| | | | 1.OG | 65 | 55 | 75,5 | 69,1 | 61,2 | 55,7 | -14,3 | -13,4 | - | 0,7 |
| 3 | Black road 3 | South | EG | 65 | 55 | 62,0 | 58,3 | 55,9 | 50,5 | -6,1 | -7,8 | - | - |
| | | | 1.OG | 65 | 55 | 65,3 | 60,4 | 57,5 | 52,6 | -7,8 | -7,8 | - | - |
| 4 | Black road 5 | South west | EG | 65 | 55 | 60,1 | 56,4 | 52,9 | 46,1 | -7,2 | -10,3 | - | - |
| | | | 1.OG | 65 | 55 | 62,9 | 58,1 | 54,4 | 47,9 | -8,5 | -10,2 | - | - |
| 5 | Black road 7 | South | EG | 65 | 55 | 61,7 | 59,1 | 56,2 | 50,8 | -8,5 | -8,3 | - | - |
| | | | 1.OG | 65 | 55 | 65,6 | 60,9 | 57,6 | 52,8 | -8,0 | -8,1 | - | - |
| 6 | | West | EG | 65 | 55 | 61,6 | 58,7 | 55,1 | 48,5 | -7,5 | -10,1 | - | - |
| | | | 1.OG | 65 | 55 | 65,6 | 60,6 | 56,7 | 50,4 | -8,9 | -10,1 | - | - |

If the source emissions or results change, the table will be updated when it is opened. If the geometry was altered or new receivers digitized, the table will no longer represent the model and thus the table section will report that the table is not accurate. To correct this, a new calculation run is required.

## Table Settings

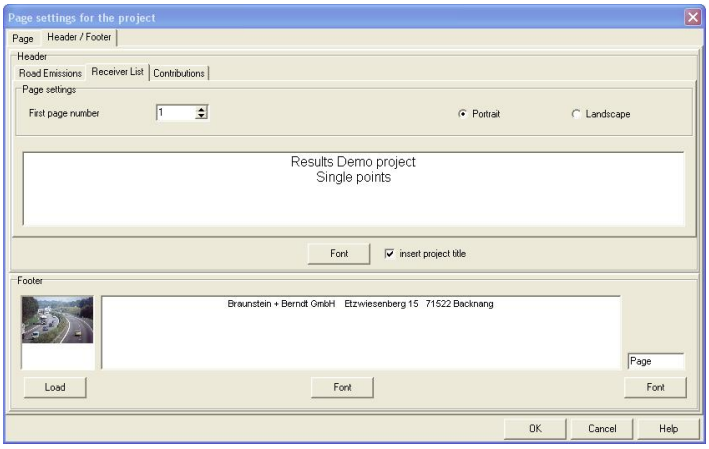
Enter **TABLE -> SETTINGS** to define the border width, headlines and character width. The settings are valid for all tables in the project.




The table consists of the middle component, the header and the footer. Enter the frame width, the height of the table header and footer sections, the landscape and portrait in [mm].

The individual areas are separated by border lines. The width of these lines can be defined.

Under the tab for header/footer, assign a headline for each of the tables that will be printed in the header.




Select if the table is to be printed in portrait or landscape format, and set the page number for the first page of the table.

You can show your company logo in the footer section. Click on the „load“ button to select the file for the logo (bitmaps or metafiles). If the logo is not present in the project folder, you can move it there, copy it, or set a link to the file.

The logo, the font settings for header and footer, and the page numbering are valid for all tables in the project.

Print the table via **FILE -> PRINT**.

### Export Tables

*Export*

You can store the emission and result tables as ASCII files. Click **TABLE -> EXPORT** or the symbol button “Export” and select where to store the data and enter the file name. It is also possible to use the clipboard (**TABLE -> COPY TO CLIPBOARD**) to insert the result table in another program.

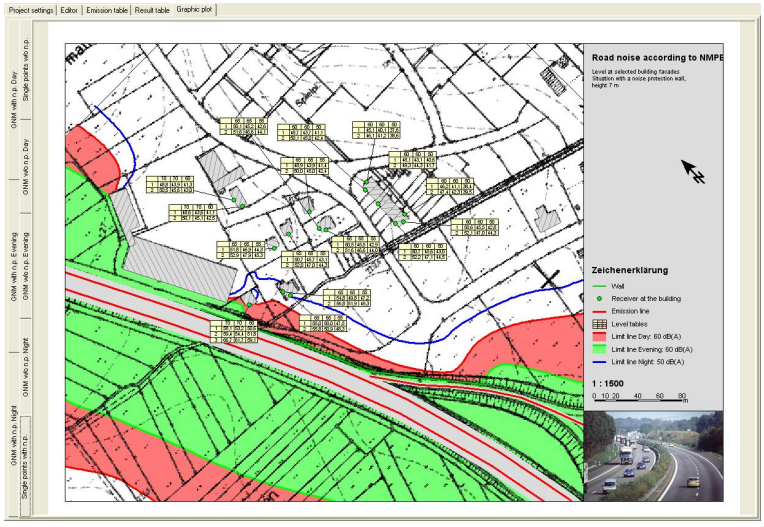
## Graphic Plot

The calculation results are presented under the tab Graphic plot together with the model geometry in preformatted maps.

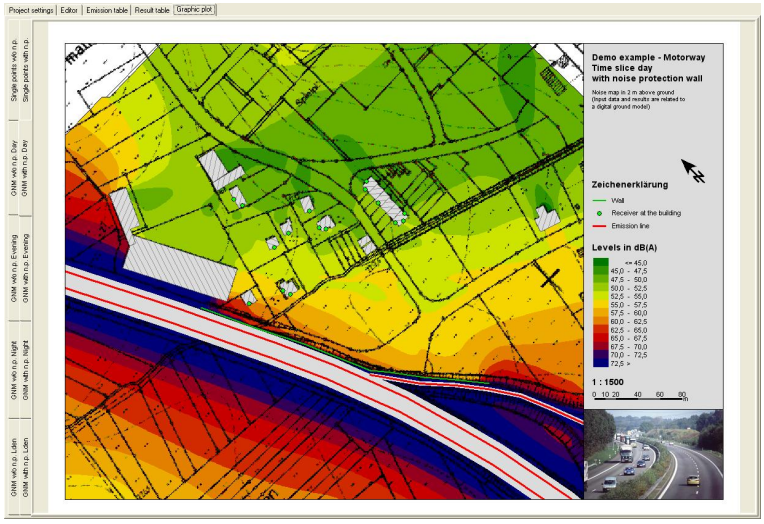
The single receiver map not only shows the results from single receiver calculations but also presents the noise limit contour lines for the calculated time slices (if calculated). If the geometry was entered on top of scanned bitmaps, the bitmap also is presented on the graphics sheet.

All objects and results can be formatted individually and selected/deselected in the graphics plot.

**Example of a single receiver map:**




**Example of a grid noise map:**




The description field contains the headers with an additional description, legend, scale bar and a company logo. For grid noise maps, the color scale is added in the description.

All formatting (font, company logo, scale …) is valid for all maps in the project. Only the content of the description text is set individually for each map.

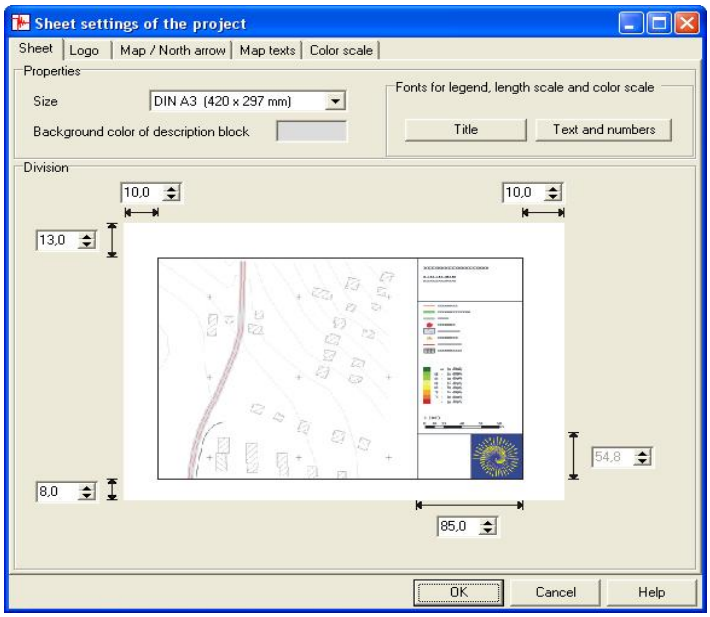
The element sequencing in the description block is fixed and cannot be altered.

The top right hosts the map header and an additional descriptive text, followed by the legend and the color scale for grid noise maps. The bottom of the descriptive includes a scale bar and the company logo.

## Set Sheet Size and Border Size

Before you determine the viewport of your map, select the sheet size and frame width so the program knows the active drawing area and can determine the scale.

Open **GRAPHICS -> SHEET SETTINGS** or click on the white frame of the sheet to define the settings.




Enter the sheet size, frame width, description block width and the height of the box for the company logo. If the company logo is placed to fill the width of the description block, the height is no longer user controllable but determined by the dimensions of the logo.

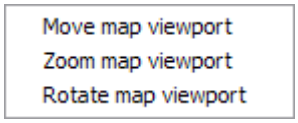
When setting the frame width, please observe the maximum width the printer is capable of printing.

In the sheet settings, additional controls define the background color of the description block and the font settings for title, legend, scale bar and color scale.

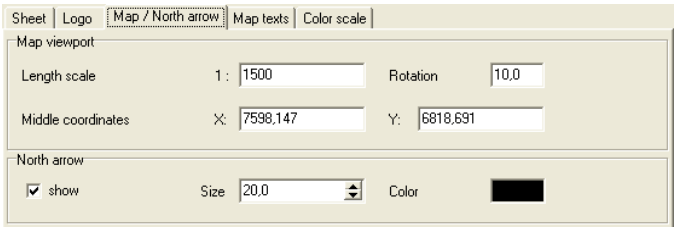
You can control the map elements using the additional tabs. You can reach the elements with the respective tabs via the graphics menu or by clicking on the element.

## Set Viewport and Scale

Before formatting, the map shows the total range of the geometry data Use the right mouse button or the graphics menu to select the proper viewport for your map.




Click on the scale bar in the description block (or **GRAPHICS -> EDIT MAP VIEPORT**) to numerically set the scale, rotation and middle coordinates, and to format the north arrow.




The **LENGTH SCALE** is automatically adjusted when zooming. When rotating the map, the north arrow and the background graphics are also rotated.

The **NORTH ARROW** can be moved to a new position by pressing the left mouse button while moving the arrow to its new position.

## Load Company Logo

Click on the lower right side of the description block or invoke this action with **GRAPHICS -> EDIT COMPANY LOGO**.

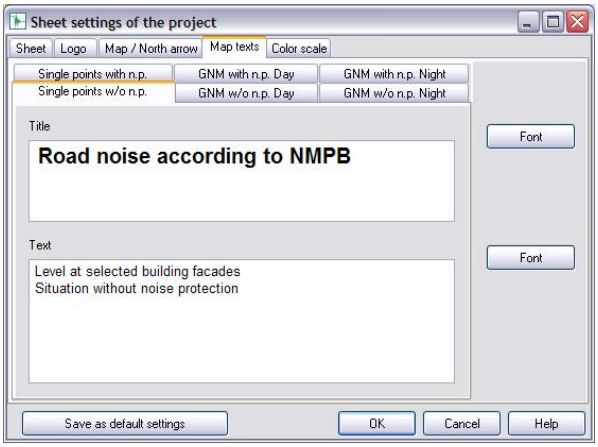
Click on **LOAD**. If the logo is not present in the project, you can decide if the logo file should be copied or moved into your project, or if a link is best. To minimize the loading time, it is best to have the logo in the BMP format.

Use **POSITION** to choose if the logo is to fit in the sheet description box according to the box height (recommended for square logos) or if the description block box should be adjusted to the logo size. After defining the box height here, it is no longer possible to control it from the sheet settings.

**Hint:** As the program only supplies a single graphics box for the company logo, you must use an external graphics program if you want to combine your logo with your company's address or web location.

## Edit Map Texts

The descriptive texts of the maps are administered separately for each of the maps contained in the project. Click on the top right section of the description block or open the map texts via the menu **GRAPHICS -> EDIT MAP TEXTS**.

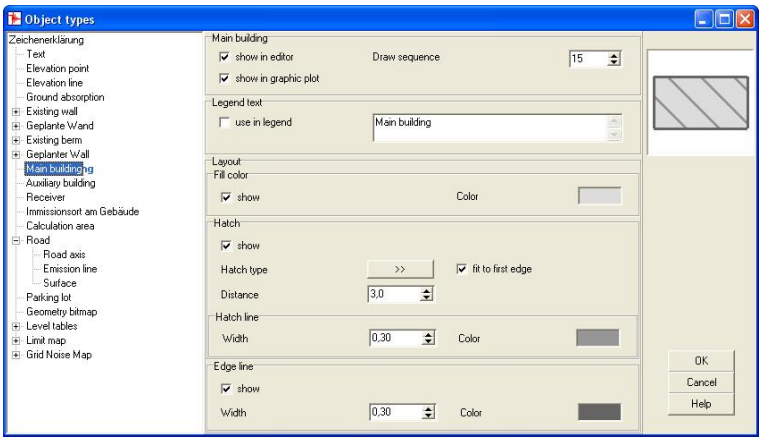



You can also move texts from one map to another using the familiar copy and paste commands. The font information is stored separately for the title and the descriptive text. The font settings are valid for all maps in the project.

## Edit Legend, Format Objects

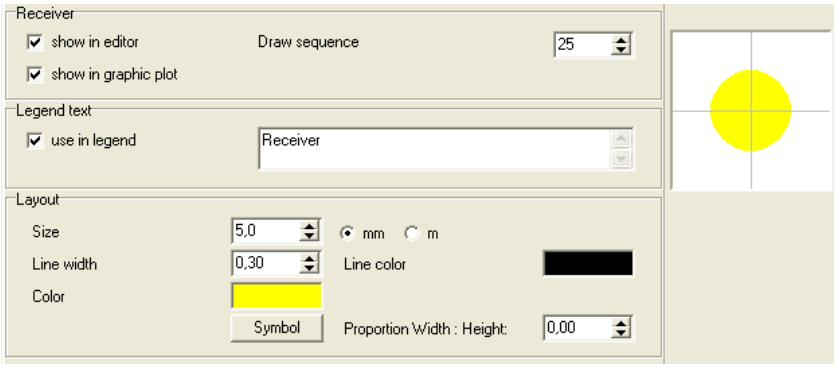
Open **OPTIONS -> OBJECT TYPES** or click on the legend and select the object type you want to customize.

The layout for all drawable data is controlled via the object type file: Geometry object types (i.e. buildings and roads), result object types (level tables, grid noise maps and noise limit contour lines), as well as geometry bitmaps. A set of default definitions for all object types is delivered with the program. You may customize these as you like.



For each object type, select if this particular object type shall be visible on the editor and in the graphics display. Also select under which label and in which sequence it shall appear in the legend. The higher the **SEQUENCING NUMBER**, the later the object is drawn (and may hide objects of a lower sequence number).

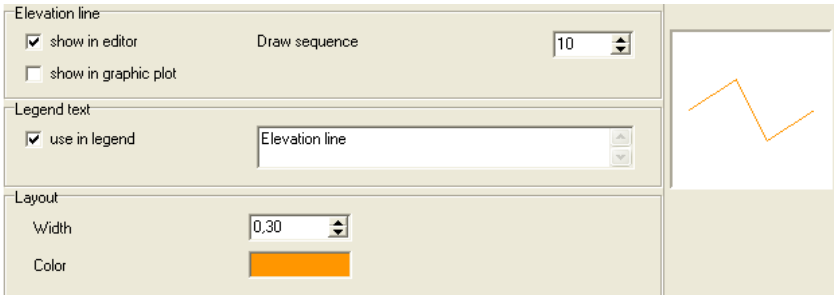
### *Point Type Object Types*




Define the size in [mm] (plan size) or in [m] (world coordinates). If selecting millimeters, the object will be drawn regardless of the scale of the drawing. If "meters" is selected, the size of the sign depends on the scale. The sign will be as large as the selected number of meters in the world coordinate scale. For the symbol size, an imaginary rectangle is drawn around the symbol. The longest side will determine the symbol size.

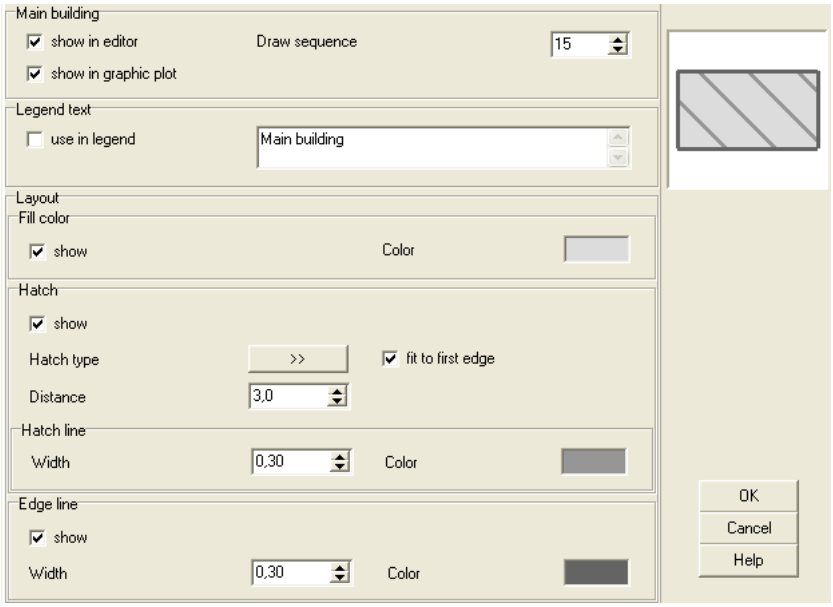
Click on the **SYMBOL** button to select a different symbol than the one proposed. Also select the symbol line width and border lines.

### *Line type object types*




Enter line width and line color for the line.

### *Area type object types*




For area object types, define the fill color and border and hatch pattern independently of each other.

#### Hatch pattern

With the double arrow, select the hatch pattern and confirm it with OK.

If **FIT TO FIRST LINE** is marked, the hatch pattern will be parallel to a line through the first 2 coordinates of the object.

### *Texts*

The text layout is set in the editor. All settings (color, font type) in the graphics are taken from the definitions made in the editor. In the object types, you can adjust the sizes of all texts using the parameter **SIZE AS FACTOR** of the sizes selected in the editor.

### *Composite Object Types*

Some of the object types consist of multiple sub-types (for example, roads, railways and noise protection walls). The layout of the sub-object types is defined independently of each other. Select which of these sub-objects shall be drawn in the editor, map and legend.

## Single Receiver Maps

The single receiver map depicts all results of the single point calculation for all available time slices and floors in small tables. In addition to the single receiver tables, it is also possible to display the noise limit contour line for all time slices (if the contours have been calculated). As receivers might cluster in one location, you can move the level tables. When the cursor is close to the level table, its shape changes to the movement cursor. Press the left mouse button and move the table to its new location.

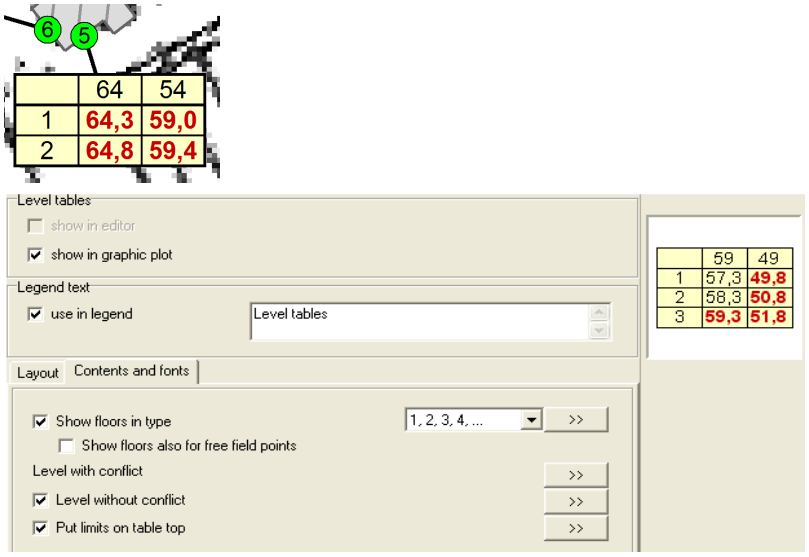
When the noise limit is exceeded on a receiver attached to a building, the facade where the receiver is located is marked with a red bar.

### *Edit the Settings of the Level Tables*

Open **OPTIONS -> OBJECT TYPES** or click on the legend and select the object type for level tables.

The level tables can be presented for all calculated receivers or only for those where the noise limit is exceeded.

By default the point number of a receiver is displayed in the reference point.



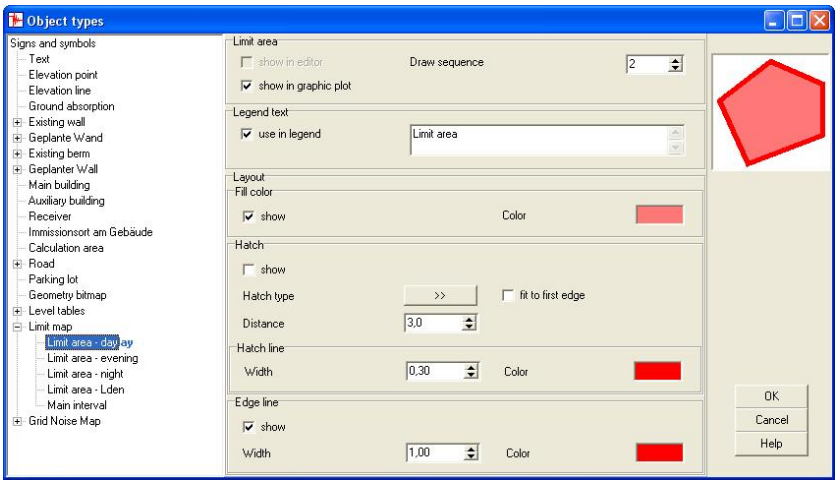

The sub-object type **LEVEL TABLE** is structured in the tabs for "*layout*" and "*content + fonts*".

Under the tab layout, set the line thickness and color of the separating lines, and define the placement of the floors. Under the tab content and fonts, you can mark what shall be printed in the table. The receivers exceeding the noise limit are always presented. Use the double arrow to move to the font layout.

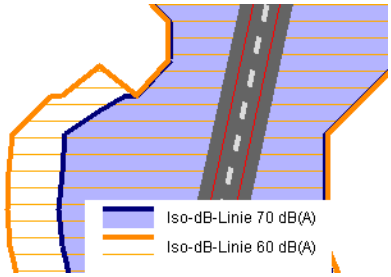
The **FACADE WITH NOISE LIMIT VIOLATION** is formatted in the second sub-object type.

### *Process the Noise Limit Contour Lines*

For each time slice assigned a noise limit value in the project settings and activated for display, the noise limit contour lines are presented on the single receiver maps. The appearance of the noise limit contour lines is edited under **OPTIONS -> OBJECT TYPES** in limit contour line.




The contour line is displayed in the border color. You can also fill the areas with a solid color or select a hatch pattern if multiple contour lines overlap.



## Grid Noise Map

The Grid Noise Map presents noise contour lines with the area between the contours filled with a user controlled color scale. The appearance of the noise map can be edited (contour lines and color scale).

### *Edit the Appearance of contour lines*

Call **OPTIONS -> OBJECT TYPES** and select the object type grid noise map.

**SHOW CONTOUR LINES** should always be set to „show“ except when you want to present the grid cells. When the switch is deactivated, even for the main interval, no contour lines and contour fills are drawn.

The **FILTER BAND WIDTH** [m] sets a band width within which points controlling the contour lines are deleted; this procedure smoothes the contour lines.

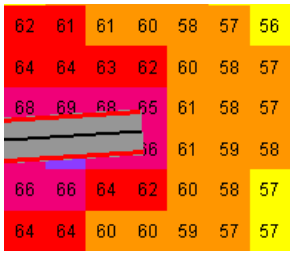
The **BEZIER TYPE** sets the form accuracy of the contour lines. With exact Bezier curves, the contour lines will move through the calculated interception points. The smooth Bezier option means the interception points are only used to pull the curve in its direction, but will not force the curve to go through it.

The exact Bezier curve moves through the calculated points of the contour lines. However, when the lines have strong and changing curvature, this option will make the line less accurate.

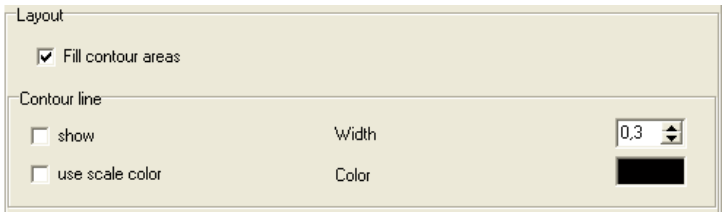
The **BORDER LINE** (calculation area border) is not a contour line, so you can select separately how this line will be presented. Please specify the color and line width.

If you want to present the grid, activate the checkmark **DISPLAY GRID** and deactivate **DISPLAY CONTOURS**. You can also have the program interpolate the colors of the scale to more closely represent the colors of the grid cells by requesting a **FLUID SCALE**.

The grid values can be presented in the middle of each grid cell by requesting the **VALUES AS TEXT**.




### Definition of intervals



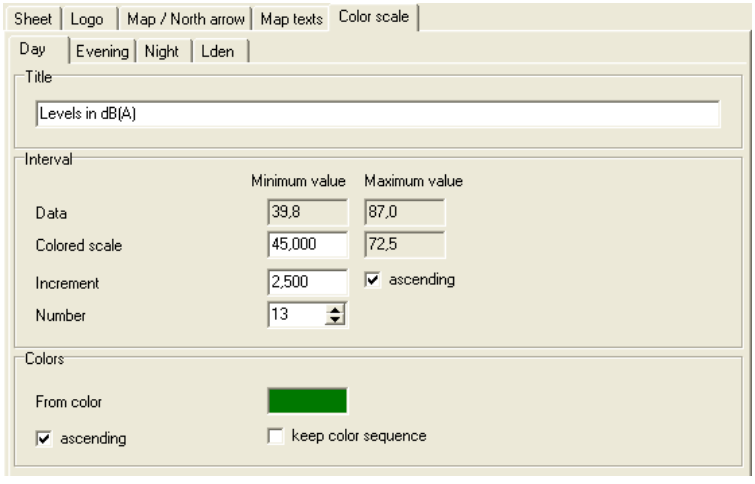

**FILL CONTOURS** fills the areas between the contour lines according to the scale colors. You can also choose to have the contours themselves presented as lines, and choose the color and line width.

Additionally, you can disable the **FILL CONTOURS** and display the contour lines according to the scale colors.

### *Edit the Colored Scale*

When the grid noise map is loaded, the program will poll the minimum and maximum values of the grid noise map and suggest a sensible scale covering the value range of the map. The color sequences are chosen from the color palette.

Click on the color scale in the description block or invoke **GRAPHICS -> EDIT COLOR SCALE**.



Enter the value of the smallest interval, the magnitude of the intervals (in dB(A)) and the number of intervals. **ASCENDING** defines if the lowest noise levels are on the top or the bottom of the scale.

For the **COLOR SELECTION**, a color palette is used. A line in the palette has 16 color fields so you can manage your scales and store the color sequences properly. SoundPLAN *essential* is delivered with a default color scale. You can define your own scale color progressions any time via OPTIONS -> COLORS (see Color Palette " on page 44).

The scale uses the colors starting from the field marked **FROM COLOR**. **ASCENDING** defines if the colors start from the marked field to the left or right (with „ascending" deactivated).

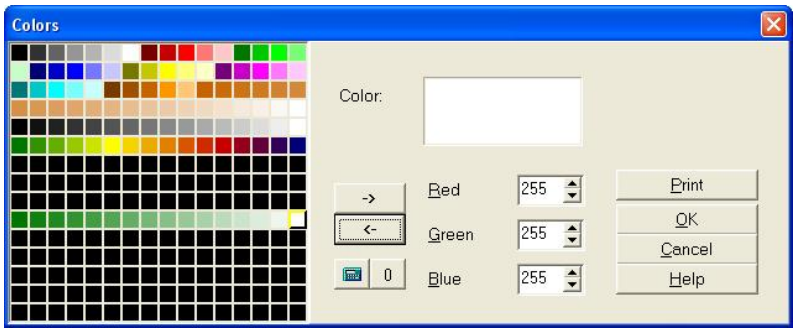
If less than 16 intervals are used, SoundPLAN *essential* selects a color sequence from the following 16 colors. Select **CONTINUOUS COLORS** to disable the automatic assignment of colors.

## Color Palette

The color palette is used to control the color of the objects and elements and the scale colors. 16 consecutive colors are used for the scale colors.

Open the colors via the menu **OPTIONS -> COLORS**. The values are defined as RGB values.

RGB = Red-Green-Blue-components for each color range from 0 to 255.




### *Define New Colors /Compose Scale Color Sequences*

To define a new color or edit an existing one, select the color field you want to edit by activating it with the arrow to the right (double clicking on the color field is a shortcut). The color and its red, green, blue components are shown in numerical values and in the enlarged color field. The color can be modified by changing the numerical values or by using the pick arrows (up/down). Changes can be seen immediately in the color field. The colors on screen are not always a true representation of the printer colors.

When satisfied, use the arrow to the left to transfer the color settings to the active field in the palette. The color is always entered in the field that is active in the palette.

Use the arrows right/left to not only edit colors, but also to move/copy colors from one spot of the palette to another location of the palette to generate new scales, etc. Click on the color in the palette -> arrow right -> click on the desired color field in the palette -> arrow left.

### *Interpolate Colors*

*Pocket calculator to interpolate color values*

In order to generate color sequences in scales and to work with shades of colors, it is possible to interpolate the RGB values between 2 set colors. Select the first color and set it on an existing (empty) black field. Then select a second color and set it on a black field to the right of the first one. By clicking on the symbol for the pocket calculator, any number of black fields between the first and the second color will be filled with an interpolated color.

**Hint:** If you want to generate a gray scale, select a value different than (0,0,0) for the first value, because black is ignored in the sequencing. Select the value for the first color to a dark gray, for example 5,5,5.

### *Delete Color Values*

*Delete color values*

To delete a single color, activate the color field, click the button „0"and click on the color field again.

To delete a color sequence, click on the first color, click the button „0“ and click the last color.

### *Print Color Palettes*

The entire palette can be printed using the **PRINT** button. The colors are shown with RGB values. The colors on the printer depend on the saturation, resolution and the printer paper. It is wise to print the color palette at least once to confirm that the colors are suitable for what you want to depict.

## Export and Print Graphics Sheets

*Print*

Click on the button “print” to print the map on the plotter or save it in a pdf file. If the margin of your sheet is cut, the selected margin width of the sheet is too small for the maximum print size of your printer. In this case call **GRAPHICS -> SHEET SETTINGS** and correct the margin width.

*Export*

You can save graphics sheets as bitmap or Windows Metafile using the button "Export". Always the sheet displayed on the screen is exported. Use **GRAPHICS -> EXPORT GRID VALUES** to save the grid values of the displayed map in a text file.

# Annex

## Files in SoundPLAN *essential* Projects

The geometry data are stored in different files in the project folder with the following names:

| | |
|---|---|
| GeoRoad.geo | Roads |
| GeoRail.geo | Railways |
| GeoIndu.geo | Industrial sources |
| GeoPlot.geo | Parking lots |
| GeoObjs.geo | All other geometry objects for projects with one variant |
| GeoWand.geo | Noise protection wall for projects with the variant "with noise protection" |

The results are stored under the following numbers:

| | |
|---|---|
| 1 | DGM |
| 11 | Single point calculation (one variant) |
| 12 | Limit contour lines (one variant) |
| 13 | Grid noise map calculation (one variant) |
| 21 | Single point calculation (two variants) |
| 22 | Limit contour lines (two variants) |
| 23 | Grid noise map calculation (two variants) |

When different noise types are combined in one project, the numbers for each calculation are increased by 100.

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